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Mechanical and Electrical Engineer

OCTOBER, 1951

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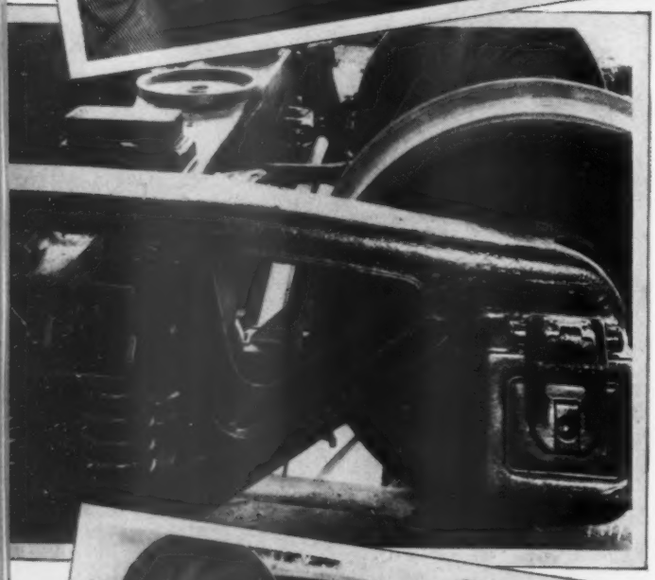

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OCTOBER, 1951

VOLUME 125

No. 10

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C. W. Merriken, Jr.
Business Manager, New York

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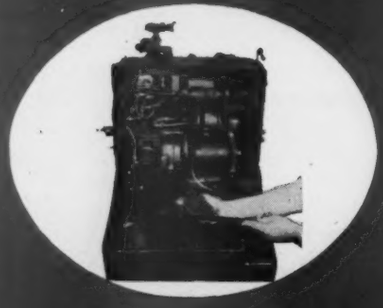

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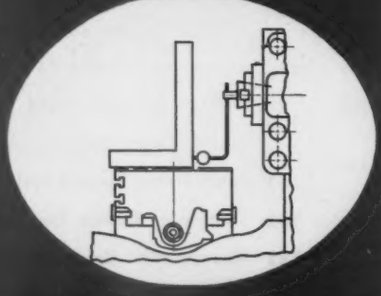

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RAILWAY Mechanical and Electrical Engineer

Chicago Coordinated Meetings Show New Trends

With an attendance of 3,818 railroad and supply men the problems of car and locomotive maintenance were discussed in many group meetings.

THE far-reaching effect of the rapid transition from steam to diesel power, the rapid improvement in passenger and freight cars and the cumulative effect of the many public relations and employee relations difficulties that the railroads now find themselves faced with are making it necessary to take stock of the situation and make some intelligent plans for the future. These were the themes of the principal speakers before the meetings of the Coordinated Mechanical Associations and the Electrical Sections, A.A.R., at the Hotel Sherman, Chicago, September 17-19, 1951. These addresses were by J. P. Kiley, president, Chicago, Milwaukee, St. Paul & Pacific before the Car Department Officers' Association; L. W. Horning, vice-president, personnel and public relations, New York Central, before the Railway Fuel & Traveling Engineers Association; F. K. Mitchell, manager, equipment, New York Central, before the Locomotive Maintenance Officers' Association, and by D. V. Gonder, assistant vice-president, Canadian National before the Master Boiler Makers' Association.

The registration for the three-day meeting totaled 3,818.

Four associations participated in joint sessions during the meetings. On Monday, the Railway Fuel and Traveling Engineers' Association was joined by the Air Brake Association for the discussion of passenger- and freight-train handling and the operation of dynamic brakes. On Wednesday the Electrical Sections joined the Locomotive Maintenance Officers' Association for consideration of a paper on the New York Central's investigation of wheel slip on diesel-electric locomotives.

In conjunction with the meetings there was an exhibit of mechanical devices at the Hotel Sherman embracing the products of 110 manufacturers under the auspices of the Allied Railway Supply Association.

Air Brake Association

The two outstanding themes at the Air Brake Association meetings were the development of information for the maintenance of 24-RL locomotive brake equipment for road diesel locomotives and the maintenance of car brake equipment in freight service, the latter subject including the effects and prevention of leakage.

According to the report there are a minimum of 51 points from which leakage can occur in a charged brake system. Of these, 27 are in the brake pipe, leaving 24 points, 17 of which are in the AB valve itself, to be included in what is known as brake system leakage. All of these may be on the reservoir side of the feed grooves, with the result that any leakage occurring at these 24 points is not taken into account by the brake-pipe leakage test. Such leakage, therefore, increases the air flow into the train only when the brakes are released and are charged.

A paper on the standardization of diesel-electric brake equipment, which was not included in the original schedule, was presented by C. E. Miller, superintendent air brakes and steam heat, New York Central, who was chairman of a committee which canvassed opinions of the best air brake minds in the country on the functions of air brake parts, additions of desirable elements and the proper application and location of parts.

The standardization paper was essentially a progress report of a committee set up by the Air Brake Association to work up information on standardizing the location and application of diesel brake equipment. The information gathered was based on experience with some 12,000 diesel units, and after approval by the association will be processed through a similar committee of the A.A.R. and made available to the A.A.R. Committee on Diesel Standardization.

The following officers were elected to serve for the coming year: president, K. E. Carey, assistant road foreman of engines, Long Island; first vice-president, R. F. Thomas, general air-brake instructor, Canadian Pacific; second vice-president, C. V. Miller, general supervisor of air brakes, New York, Chicago & St. Louis; third vice-president, D. R. Collins, superintendent of air brakes, Denver & Rio Grande Western, and secretary-treasurer, L. Wilcox. No new executive committee members were elected.

Car Department Officers

The annual meeting of the Car Department Officers' Association brought together a large group of car department men from coast to coast to discuss subjects

Exhibitors

Aeroquip Corp., Jackson, Mich.
Air Reduction Sales Co., New York
Ajax-Consolidated Co., Chicago
American Air Filter Co., Louisville, Ky.
American Brake Shoe Co., New York
American Steel Foundries, Chicago
Apex Tool & Cutter Co., Shelton, Conn.
Association of Manufacturers of Chilled Car Wheels, Chicago
B. M. & N. Filter Company
Barco Manufacturing Co., Chicago
Barton Instrument Corp., Los Angeles
Bendix Aviation Corp., Scintilla Magneto Div., Sydney, N. Y.
Blaw-Knox Co., Pittsburgh
Bowser, Inc., Fort Wayne, Ind.
Brown-Dynalube Manufacturing Co., Charlotte, N. C.
Buckeye Steel Castings Co., Columbus, Ohio
Butler Engineering Co., New Orleans, La.
Cardwell Westinghouse Co., Chicago
Carey, Philip, Manufacturing Co., Cincinnati, Ohio
Caterpillar Tractor Co., Peoria, Ill.
Chicago Malleable Castings Co., Chicago
Chicago Pneumatic Tool Co., New York
Chicago Railway Equipment Co., Chicago
Combustion Engineering-Superheater, Inc., New York
Crane Co., Chicago
Dearborn Chemical Co., Chicago
Double Seal Ring Co., Fort Worth, Tex.
Duff-Norton Manufacturing Co., Pittsburgh
Eaton Manufacturing Co., Cleveland
Elastic Stop Nut Corporation of America, Union, N.J.
Empire Journal Lubricator Co., Chicago
Enterprise Railway Equipment Co., Chicago
Evans Products Co., Plymouth, Mich.
Fairbanks, Morse & Co., Chicago
Farr Co., Los Angeles
Flannery Manufacturing Co., Bridgeville, Pa.
Fram Corp., Providence, R. I.
Franklin Railway Supply Co., New York
Garlock Packing Co., Palmyra, N. Y.
General Electric Co., Schenectady, N. Y.
General Steel Castings Corp., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Mich.
Gustin-Bacon Manufacturing Co., Kansas City, Mo.
Hennessy Lubricator Co., Chambersburg, Pa.
Holland Co., Chicago
Hulson Co., Keokuk, Iowa
Hunt-Spiller Manufacturing Corp., Boston, Mass.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Independent Pneumatic Tool Co., Aurora, Ill.
Ingersoll Rand Co., New York
Johns-Manville, New York
Joyce-Cridland Co., Dayton, Ohio
Leslie Co., Lyndhurst, N. J.
Lipp, J. J., Paper Co., Chicago
Locomotive Finished Material Co., Atchison, Kan.
Lunkenheimer Co., Cincinnati, Ohio
MacLean-Fogg Lock Nut Co., Chicago
Magnaflux Corp., Chicago
Miller-Felpax Corp., Winona, Minn.
Miner, W. H., Inc., Chicago
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Modern Railroads Publishing Co., Chicago
Monarch Packing & Supply Co.
Monroe Auto Equipment Co., Monroe, Mich.
Nathan Manufacturing Co., New York
National Aluminate Corp., Chicago
National Brake Co., New York
National Malleable & Steel Castings Co., Cleveland, Ohio
National Welding & Grinding Co.
New York Air Brake Co., New York
Nugent, Wm., & Co., Inc., Chicago
Oakite Products, Inc., New York
Okadee Co., Chicago
Oxweld Railroad Service Co., Chicago
Parr Paint & Color Co., Cleveland
Paxton-Mitchell Co., Omaha, Neb.
Punch-Lok Co., Chicago
Pyle-National Co., Chicago
Rail Flange Lubricator Co., Portland, Ore.
Railroad Supply & Equipment, Inc., Scranton, Pa.
Railway Equipment & Publication Co., New York
Railway Purchases & Stores, Chicago
Sargent Co., Chicago
Schundler, F. E., & Co., Joliet, Ill.
Scullin Steel Co., St. Louis, Mo.
Simmons-Boardman Publishing Corp., New York
Sinkler, Joseph, Inc., Chicago
SKF Industries, Inc., Philadelphia, Pa.
Spring Packing Corp., Chicago
Standard Car Truck Co., Chicago
Superior Hand Brake Co., Chicago
Swanson, O. W., Co., Chicago
Timken Roller Bearing Co., Canton, Ohio
Turco Products, Inc., Los Angeles
T-Z Railway Equipment Co., Chicago
Union Asbestos & Rubber Co., Chicago
Unit Truck Corp.-Buffalo Brake Beam Co., New York
Universal Railway Devices Co., Chicago
Van Der Horst Corp. of America, Olean, N. Y.
Vapor Heating Corp., Chicago
Viloco Railway Equipment Co., Chicago
Watson-Stillman Co., Roselle, N. J.
Waugh Equipment Co., New York
Westinghouse Air Brake Co., Wilmerding, Pa.
Wine Railway Appliance Co., Toledo, Ohio
Wyandotte Chemicals Corp., Wyandotte, Mich.
Youngstown Steel Door Co., Camel Sales Co., Cleveland

such as freight-car interchange, billing and loading rules, air-brake maintenance, lubrication, wheel-shop practice, preparation of freight cars for higher commodity classification, air distribution in air-conditioned passenger cars and paint materials for passenger cars.

In addressing the opening session, J. P. Kiley said that, whereas railway men in many departments contribute to train operation, the rolling stock would not be on the rails at all without car men, who are now faced with the urgent need to find improved methods of doing their work. He mentioned the intense competition confronting the railroads and said that major efforts to give industry constantly improved freight service and passengers more speed, comfort and convenience must not be allowed to slacken, even if some railroad problems might otherwise be simplified. Present hot-box difficulties, he said, are partially due to stepped-up speeds in freight service, and while speed reduction would help reduce hot boxes, such a solution would be an admission of defeat. Mr. Kiley said that, but for the efforts of car men, the railroads would have even more hot boxes to deal with than they have now. These men, by better servicing of plain-bearing journals, do their share to cut down hot boxes which are causing train delays, disrupted freight schedules and higher costs.

Mr. Kiley said "It is true that car men can't do the best job for the railroads unless real coordination exists. While it is the duty of people in the operating department to get trains out of terminals and over the line, they defeat their own purposes if trains are handled in such a way as to damage cars. A coupler or its attachment damaged, a waste grab due to rough switching that can mean a hot box out on the line, a car end broken or bent due to shifted lading, all of these inevitably mean delay in yard or on the line." He also mentioned the problems in servicing and maintaining complex, modern passenger cars, including air-conditioning equipment, which the public likes and hence must be kept functioning properly.

The following officers were elected to service for 1951-52: president, W. N. Messimer, general superintendent equipment, Merchants Despatch Transportation. Vice-Presidents: A. H. Keys, superintendent car department, Baltimore & Ohio; R. Schey, general superintendent car department, New York, Chicago & St. Louis; J. F. Likarish, master car builder, Great Northern; E. E. Packard, district master car builder, Southern Pacific. Secretary-treasurer: F. H. Stremmel, assistant to secretary, A. A. R. Mechanical Division.

Electrical Sections

The joint sessions of the two Electrical Sections of the A.A.R. were called to order at 10:00 a.m., Monday, September 17, at the Hotel La Salle, Chicago, by H. F. Finnemore, chief electrical engineer, Canadian National, and chairman, Electrical Section, Engineering Division, A.A.R.

Having welcomed members and guests, Mr. Finnemore described the value of the reports to be presented and encouraged discussion. He said that the proposed amalgamation of the two sections had now been endorsed by both sections and would be brought before the board of directors of the A.A.R. for approval. The consolidation, if approved, will become effective January 1, 1952.

L. C. Bowes, electrical engineer, Rock Island, chairman, Electrical Section, Mechanical Division, A.A.R., laid stress on the responsibility of railroad electrical departments and said that air conditioning alone had doubled previous electrical maintenance requirements, and that diesel-electric locomotives have done much more to increase them. To this, he said, maintenance had been added by shop equipment.

Most of the electrical equipment, Mr. Bowes said, is highly specialized and requires much in the way of carefully selected and trained men. He asked section members to recognize their responsibility when called upon to be members of a committee.

Officers of the Electrical Section, Mechanical Division,

The President's Luncheon at the Hotel Sherman, Chicago, September 18

were elected to serve during the 1951-52 period as follows: chairman, H. C. Paige, assistant mechanical engineer, New York, New Haven & Hartford; first vice-chairman (west), R. I. Fort, assistant research engineer, Illinois Central; second vice-chairman (east), C. W. Nelson, electrical engineer, Chesapeake & Ohio. Members of committee of direction; P. H. Verd (west), superintendent motive power, Elgin, Joliet & Eastern; and E. J. Feasey (east), general supervisor, diesel equipment, Canadian National.

Officers of the Electrical Section, Engineering Division, are to be elected later in the year by letter ballot.

Locomotive Maintenance Officers

During the three-day meeting, in addition to the presentation of the technical reports, addresses were delivered by F. K. Mitchell, manager, equipment, New York Central System, and Edward W. Davidson, director, Bureau of Locomotive Inspection, I.C.C. Mr. Mitchell's address appears elsewhere in this issue. Mr. Davidson, in discussing safety in relation to diesel locomotives, made a special plea for a more thorough inspection of diesel wheels and brake rigging and a number of other locomotive appurtenances that are causing trouble, as well as better "housekeeping" on diesel power as a fire-prevention and accident-reduction measure. In conclusion, Mr. Davidson said in part: "We of the Bureau of Locomotive Inspection stand ready to assist in any way to effect improvement in safety on railroads. That is our job. We have certain duties in the enforcement of the law and in inspection of locomotives and an obligation to determine that they are 'in proper condition and safe to operate,' but as you know we do not like to find unsafe conditions. We much prefer to be able to give a terminal a clean bill and the personnel at that terminal a pat on the back for a job well done than to prepare a long list of defects and perhaps a few red cards."

President Paul H. Verd, superintendent motive power, Elgin, Joliet & Eastern, mentioned in the opening session that the increasing number of diesel units and the pressure of increasing costs were changing the ideas of many roads with respect to maintenance and that careful planning of facilities must now be done.

During the meeting life memberships were awarded to W. T. Faricy, president, A.A.R., and J. H. Aydelott, vice-president, operations and maintenance department, A.A.R.

Mr. Faricy, in discussing the rate situation in his remarks following the presentation said, in part, "Everybody knows by this time that the rate increase the Interstate Commerce Commission granted the railroads recently was wholly inadequate. . . . The increase asked was 15 per cent; they granted 9 per cent in the East, 6 per cent in the West, 6 per cent in the South."

The figures on which railroads rested their case, the A.A.R. officers said, show that since 1939, the year the recent war started in Europe, railroad wage rates have gone up 140 per cent and the cost of materials purchased by railroads has increased approximately 131 per cent, while railroad revenues—in terms of revenue per ton-mile—are estimated to be no more than 45 per cent higher, including the latest (Ex Parte 175) increase. This disparity between income and outlay is too big a gap to be completely bridged, he emphasized.

"A lot of it can be bridged, has been bridged by increasing efficiency," Mr. Faricy continued, "but it is the national policy, as written into the Defense Production Act, through the so-called Capehart amendment, that

businesses generally are allowed to increase their prices by increases that have taken place in wages and materials. We in the railroad industry feel that although we are not subject to Office of Price Stabilization regulations, but, instead, are under the I.C.C., that this same principle should be applied to railroads. It is difficult for us to see why we, alone, should be singled out and told that we may not raise our prices by the amounts that our costs have gone up."

With the exception of one report on steam locomotive terminal operation and a report on personnel training, all of the other eight reports dealt with some phase of diesel mechanical and electrical maintenance.

Of incidental interest is the fact that the paid membership of the L.M.O.A. is now over 3,200, making it one of the largest associations in the railroad industry.

The following officers were elected for the ensuing year: president, H. H. Magill, superintendent motive power, Chicago & North Western; first vice-president, S. M. Houston, assistant general superintendent motive power, Southern Pacific; second vice-president, F. D. Sineath, assistant general superintendent motive power, Atlantic Coast Line; third vice-president, T. T. Blickle, mechanical superintendent, Coast Lines, Atchison, Topeka & Santa Fe; fourth vice-president, J. T. Daley, superintendent motive power, Alton & Southern. E. K. Bloss, mechanical superintendent, Boston & Maine, was elected to the Advisory Board, and W. E. Lehr, superintendent motive power, Lehigh Valley; F. W. Bunce, superintendent motive power, Chicago, Milwaukee, St. Paul & Pacific, and A. L. Wright, superintendent equipment, New York Central, were elected to the executive committee for one-year terms. C. M. Lipscomb, assistant to schedule supervisor, Missouri Pacific, continues as secretary-treasurer.

Master Boiler Makers

With his "Eye to the Future" address, D. V. Gonder, assistant vice-president—operations, Canadian National, set the theme of the thirty-fourth annual meeting of the Master Boiler Makers' Association. Facing the fact that the boilermakers' craft is adversely affected by the rapid dieselization of the railroads, Mr. Gonder presented several suggestions for new opportunities. He told the members they should improve themselves by studying labor relations, by knowing accounting procedures and how to allocate material and labor costs, and by looking around for work in which the experience and craftsmanship of the boiler maker can be utilized by the railroads. Some of the new fields suggested were parts of diesel locomotive maintenance, the fabrication of structural members, stationary boilers, and steel car work.

The association started its "looking-to-the-future" program by changing its constitution to make railroad welding and water service supervisors eligible for active membership and to hold office, these two classifications having been restricted to active boiler makers in the past. It proposes to strengthen its future programs in these two fields that are closely allied to the work of the boilermaking craft .

President R. W. Barrett, chief boiler inspector, Canadian National, presided at the meeting.

New officers elected for the following year are: president, H. C. Haviland, supervisor of boilers, New York Central; vice-president and chairman of the executive board, H. R. Barclay, general boiler inspector, Northern Pacific; secretary of executive board, F. R. Milligan, general boiler inspector, Canadian Pacific. A. F. Stiglmeier was re-elected secretary-treasurer. Also re-elected as members of the executive board are R. A. Culbertson, general master boiler maker, Chesapeake & Ohio; Benjamin G. Kantner, general boiler and welding supervisor, Reading, and F. E. Godwin, system chief boiler inspector, Canadian National. A. A. Edlund, assistant general boiler inspector, Chicago, Milwaukee, St. Paul & Pacific, was elected as a new member of the executive board.

Railway Fuel and Traveling Engineers

For Mr. Horning's address the members of the Railway Fuel and Traveling Engineers' Association were joined by many from other groups. Too often, he said, industry has not applied to its human relations the same degree of effort and skill that it has used in dealing with mechanical aspects. As a result, understanding between management and employees, and between management and the public, has suffered, with all three parties being the losers.

He felt that one of the most pressing concerns facing the railroad industry today is the winning of better public relations through its employees. Those in or near the front line of supervision are in a strategic position for reaching the broad ranks of employees, who, in turn, can exert great power on behalf of good public relations.

Railroads need favorable relations with the public because they face aggressive competition and because they are subject to control by agencies of the public. These can be fostered by employees other than those in direct contact with the public—engine crews, for example, by the way they handle both freight and passenger trains and by the way they observe smoke control regulations. All employees—as members of their community—can help shape the opinions of their friends toward their company. They can do this when they come to look upon themselves as auxiliary public relations men and to accept public relations as part of their job.

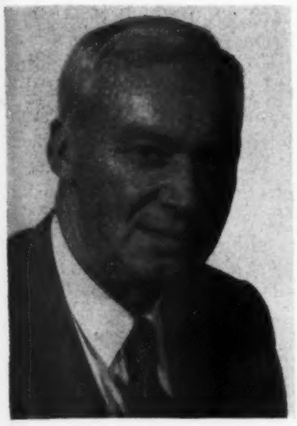
The best way to get a man to do something is, first, to get him to want to do it, and there are two ways of accomplishing this in so far as public relations consciousness is concerned. First, share the knowledge of what the railways face in general and what his particular employer is up against. Second, do not ignore the essen-

(*Continued on page* 65)

* * *

REGISTRATION—COORDINATED 1951 MECHANICAL MEETINGS

Associations	Railroad Men
Air Brake	280
Master Boiler Makers'	215
Car Department Officers'	563
Locomotive Maintenance Officers'	1,017
Railway Fuel & Traveling Engineers'	268
Electrical Sections, A.A.R.	155
	2,498
	Supply Men
Allied Railway Supply, Mechanical	1,152
Allied Railway Supply, Electrical	168
	1,320
Total	3,818



We Pause To Plan*

By F. K. Mitchell †

NEVER was it more essential that careful planning precede final action than it is now while most railroads are in the process of substituting diesel-electric motive power for steam. This is true regardless of the size or character of the railroad involved. Unless it is done, any railroad may find ultimately that they are without adequate facilities; have adequate facilities at the wrong location; either have too many or too few power units, or have the wrong type of power for the job it is called upon to do. Unfortunately, some smaller roads that are close to the end of their dieselization program have already found themselves in a quandary which the lack of planning has produced.

Throughout the length and breadth of the United States there may be found now the ghost of shops and terminals once considered indispensable and later found to be unnecessary. The gradual change in the character of railroad motive power has been largely responsible for this situation. In most cases the changes which brought on the situation could not be anticipated because of their gradual development. In some few cases failure to note the trend of the possibility of change requirements being imminent has likewise been responsible for these errors. Regardless of the reason, it has been expensive and fraught with insidious results, some of which have never been fully recognized. One of these insidious things has been the necessity to disrupt entire communities when the shop or facility is closed. This, of course, cannot be entirely eliminated, but it can and should be minimized. The less there is of it, the greater the economy which will accrue to the railroad company and the less the destruction there will be to the morale of the employees.

We are now faced with the greatest change in the character of motive power that has ever been experienced in the history of the railroad business. Over night, a new transportation tool has been placed in our hands which offers possibilities never heretofore available. The change we are going through in a short period exceeds all the changes which have accrued since the first steam locomotive was put into service. Therefore, the chances of error in our preparation to get the most out of this tool are far greater than any which have been experienced in the past. It, therefore, behooves us to have a definitely clear picture of what we will need in the way of motive power, heavy repair shops, terminal facilities, fueling and sanding stations before we proceed too far.

How will your railroad be operated when we are fully dieselized? This is a problem which cannot be solved without clear thinking. It is primarily, of course, the matter for the transportation and operating officers of a railroad to determine. Generally speaking, we have now had enough experience to know what the new form of motive power can be expected to do. We have a good idea of its capacity to handle tonnage, to produce gross ton-miles, its availability, its fuel and its sand requirements, and finally the type and extent of maintenance which will be necessary. Based on these known facts, the problem is how can we use the diesel-electric locomotive to the greatest advantage and what effect will this have on our operation? We now have a locomotive which, quite in contrast with the steam locomotive, is not limited in its ability to handle trains of any type or size or to operation on one or two divisions, but only to the unit combinations and the territorial areas in which it is found economical to use it.

It is quite obvious, therefore, that, if we assume that we are going to need shops, maintaining and servicing facilities of this type of power in the same locations that were found necessary when steam power was involved, we are likely to over build or to have our facilities in the wrong locations. These days the cost of such errors is enormous. Let us assume that we build only one too many maintenance facilities or build it in the wrong place where it must be abandoned. If this facility is one capable of doing all the necessary work on a large group of diesel locomotives between general repairs, we have probably thrown away in the neighborhood of two and one-half million dollars. If we build only one too many running repair facilities, depending upon its character, we may have thrown away in the order of a quarter of a million dollars. Even if we install only one fueling and sanding facility that is not going to be needed or is found to be improperly located, we may spend a hundred thousand dollars more than is necessary. All of these useless expenditures, to say nothing of the effect on the morale of employees, if we find it necessary to abandon a facility, emphasize that the plan must be as near perfect as it can be made. We must, in planning the operation of our railroad, fix the most economical points at which to place each type of facility. This, therefore, is the first and probably the most important step in the planning.

How Many and What Kind?

What will the number and type of diesel locomotive units required ultimately be? After the operation plan

* An address before the Locomotive Maintenance Officers' Association at the Annual meeting, Chicago, September 17, 1951.

† Manager, Equipment, New York Central System.

is completed, based on our knowledge of the capabilities of the diesel locomotive, this step is more or less routine, but for that reason it is nonetheless important and involves some features that must not be overlooked. Primary among these are the types of power most adequate to handle the various kinds of services. The roads which were unfortunate enough to complete, or nearly complete, their dieselization before the road switchers came into being have already found themselves at a loss to know where to turn for an adequate motive-power unit to handle their local service. Such pertinent questions as whether or not the dynamic brake, steam generators, multiple unit control, train control and other features locally required for the most economic operation must be considered as well as the size and capacity of the various types of diesel locomotive units to be acquired. Any errors in decisions reached on these questions could, of course, be corrected later, but in so doing the cost will no doubt pyramid and during the changeover the availability would be materially affected.

Further, it must be determined, particularly on roads where business levels vary widely, how the peaks can be taken care of with the least expense. No road, large or small, can afford to have diesel-electric locomotives standing by with nothing to do, waiting for peak business in either freight or passenger service to develop. Certainly the plan should incorporate as many multiple purpose locomotives as are necessary to cover the peaks. This is a matter for considered study. Any mistake in one direction may result in a road not having adequate power when it is needed, and a mistake in the other direction may mean an expenditure of some one hundred thousand dollars per unit for each unit eventually found not to be absolutely necessary. Fortunately, on most roads the peak of passenger and freight business does not occur at the same time. Therefore, the dual-purpose or the all-purpose locomotive seems to fill the bill satisfactorily.

It is true that, following this procedure, there may be occasions when the available locomotive unit may not be exactly the one which would be selected otherwise. Perhaps in off periods it may be necessary to work a locomotive of greater horsepower than the job would require, or, on the other hand, during peak periods it may be necessary, for instance, in passenger service to use a locomotive not capable of the top speed which normal operation would require. Nonetheless, it is certain that these temporary restrictions will not be prohibitive and will furnish an acceptable medium for getting over the peak. Because of all of these pertinent matters, any road's study as to the ultimate power requirements must, of necessity, be done on a system-wide basis in order to get the greatest use and the most satisfactory performance from a minimum motive-power complement.

What will the ultimate heavy repair shop requirements be? There was a time when divisional back shops were a necessity. The development of the steam locomotive and the gradual increase in its availability and its ability to operate satisfactorily over more than one division started a trend toward fewer back shops which has continued through the years. We are now faced with the problem of how extensive the reduction in the number of back shops will be when the dieselization is completed. Fortunately, it is generally conceded that little change is required to make a steam locomotive back shop of the transverse pit type adequate for general repairs to diesel-electric units. Therefore, it is quite probable that there are more potential diesel-electric back shops available than will be necessary and, if one is not found adequate, a second can easily be converted.

It is suggested that the better procedure would be to select the steam locomotive back shop which is the best located geographically for the load and attempt to do all the required diesel-electric back shop work at one point. The work load on such a shop can be estimated at this time, but it is doubtful whether it can be definitely established for the future. It is sensible to figure that back-shop requirements will grow as the age of the diesel-electric motive-power fleet increases; only time will tell exactly how much that increase will be. Therefore, if the first effort is confined to one shop believed to be adequate, it is well to have another available to take the overflow in the future if it is found that the first shop cannot handle the ultimate load. On the other hand, part of this problem is tied up with the question of what the policy is to be regarding the overhaul of diesel locomotive auxiliaries, such as engines, generators, traction motors, blowers, etc. This policy, once established, will help in the final determination. Any steam locomotive back shop known definitely not to be required for diesel locomotive operation should, of course, be dismantled for economic reasons. If there is any question about whether or not it is to be needed for the new type of power, there should be no question of preserving it until experience permits the answer to the question.

How About Terminals?

What will the ultimate terminal requirements be? Here the problem is tied up very closely to the solution of the operating question, not only with regard to the size and character of the equipment therein, but likewise with regard to capacity for various types of work. Of this type of facility there will probably be more than one basic design. There will be one type, no doubt, capable of completely maintaining diesel-electric units between general repairs. In designing such a facility, it should first be determined from the operation how many units of each type (road, road switch or switch) will have to be serviced therein. To the extent that operation permits, diesel-electric power may be worked to such a shop for the necessary attention. No attempt should be made to concentrate sufficient work of this type at one point to require any considerable amount of doubleheading or light movements thereto or from. Therefore, it is important that a facility of this character be located at a point where the available runs in and out are the greatest. The very minimum construction of such facility which may be provided with economy is essential. One of the compelling reasons for this decision is that there must be enough work load at any such facility to permit men trained for specific jobs to have work available for them at all times. Such a situation will be found to be economic and desirable. This type of facility, it will usually be found, cannot be satisfactorily or economically built into an existing steam locomotive terminal, particularly if the latter be the standard steam locomotive roundhouse.

There will be a second type of facility which will be required capable of handling ordinary emergency running repair work which cannot be diverted to the type of shop first mentioned. This facility will, in all probability, need to be equipped for dropping wheels and traction motors, overhead crane equipment adequate for head and liner work, and possibly for the renewal of such items as engines or generators. Ordinarily, it is believed that the load in such a shop will more generally be confined to diesel yard power and, perhaps, road switchers. Such a facility can, if there is one available, be converted from an existing engine terminal. Here again, the number of

facilities of this kind which are established should be held to a minimum and their location dependent upon the operational requirements, and its construction dependent upon whether there are adequate existing buildings available.

Don't Overlook Inspection Facilities

There will, no doubt, also be a third type of facility. Such a facility should provide an inspection pit and probably need not include either drop pit or overhead crane facilities. As a matter of fact, if climatic conditions are favorable, at this type of facility a building is not a must. It may be required because of the isolation of the point and the fact that the power handled has no opportunity to get into a more adequate shop except at intervals, or, on the other hand, it may be required as an inspection station in which it can normally be determined whether the necessary work can be done on the spot or whether the unit must be sent to a more adequately equipped facility. Such a facility as is now being discussed should, of necessity be either in the yards or closely adjacent thereto in order to minimize the turnaround time of all power not requiring extensive inspection or repair work.

What will the future requirements for fueling and sanding facilities be? Quite obviously there must be fueling and sanding facilities in connection with the first two types of facilities mentioned above. In connection with the last type of facility discussed, however, it may not be advisable to have either permanent fueling or sanding facilities. In some instances it may be found that the fueling can be satisfactorily handled by tank wagon service or from a fuel car. This same car can be built to also dispense dried sand, dried elsewhere and supplied to the point by "X" equipment.

At points where permanent fueling and sanding facilities are a requisite, the number of tracks served, the capacity of fuel and sand supplied must be determined from the character of the operation and the number of units forecast to be dispatched daily. The fuel supply at such a facility should probably fe adequate for at least ten days' operation. The sand supply should likewise be adequate for at least ten days' operation. Whether sand is to be dried locally or at some central point should be determined, for the duplicating of sanding facilities where unnecessary is expensive and it may be found more economical to dry the sand at a central point, perhaps where the first type of shop is located and distribute therefrom to the other types of facilities in company cars designed for this purpose. Even though dried elsewhere, sand should be dispensed to diesel-electric units from sand towers located in the vicinity of the fueling station so that both fueling and sanding can be accomplished without the necessity of moving the locomotive. The number of outlets will be affected by the maximum size of locomotive which it is forecast to be handled at the point.

It should not be overlooked that another type of minor facility might be necessary at isolated points where diesel units are laid up overnight. Ordinarily, at such points fueling and sanding of diesel units will not be necessary. Where climatic conditions make it advisable, these points should likewise be equipped with standby service for heating diesel units so that freeze-ups will be avoided and relatively easy starting made possible before dispatchment.

What should your fuel storage facilities ultimately incorporate? This problem, of course is dependent upon the operation, the number and type of units, source of supply and other pertinent factors. For years it has been the practice to stockpile coal for steam locomotive consumption in cases of emergency or fuel shortage. There is no less reason to believe that the stockpiling of diesel fuel would be an economic and desirable practice. Diesel fuel oil storage tanks and pumping equipment adequate for unloading and loading tank cars must, of necessity, be incorporated in the overall plan. It is essential that these operations be made nearly as automatic as possible for economic reasons and their capacity should provide at least a 60-day backlog of fuel for the railroad. Their location will be dependent to a large extent on the center of gravity of diesel usage and on the sources of supply. Such problems cannot be solved by the mechanical department alone, but must be solved by joint cooperation of the transportation, stores, purchasing and mechanical departments.

If all phases of the planning for future railroad dieselization are carefully carried out at this time, the errors will be minimized and the system will work out economically and satisfactroily, but, on the other hand, if you neglect the planning and allow the system to grow up like Topsy, your headaches in the future will be many and severe. Certainly you can't do today's job with yesterday's tools and expect to have your costs in line tomorrow.

Chicago Coordinated Meetings Show New Trends

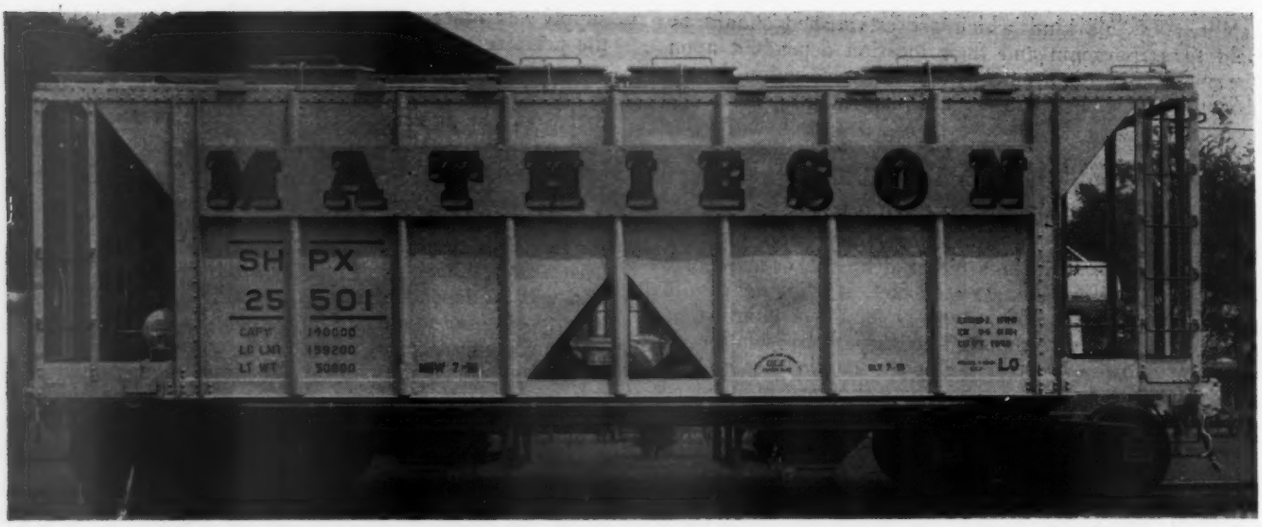
(*Continued from page* 62)

tial community of interest between labor and management.

Getting the railroad to take an active part in public relations is not making him over into something that he wasn't before. Rather, it serves as a means to guide and assist him in realizing a further potential in the interest of himself and his company. The value of this is realized by the men's own labor union who last year joined with representatives of management in a joint draft which affirmed the industry's need for public good will and the advantage to the employee in helping his company to attain it.

The program of this association, like those of the others, dealt largely with various aspects of diesel locomotive operation and the training of locomotive operating personnel. Problems relating to the efficient use of coal and oil in steam locomotives were dealt with, however, in two papers.

The following officers were elected to serve during the next year: president, R. H. Francis, general road foreman equipment, St. Louis-San Francisco; vice-presidents: R. D. Nicholson, road foreman engines, New York, New Haven & Hartford, W. H. Fortney, chief road foreman engines, New York Central, and E. L. Reeves, trainmaster, Baltimore & Ohio. The following were elected members of the executive committee: T. H. Bickerstaff, general supervisor air brakes, Atchison, Topeka & Santa Fe; T. L. Henley, chief fuel supervisor, Missouri-Kansas-Texas; F. G. LaNaster, assistant fuel supervisor, Chicago, Burlington & Quincy; R. R. Rich, road foreman of equipment, Chicago, Rock Island & Pacific; J. S. Swan, supervisor locomotive operation, Louisville & Nashville; and C. R. Patterson, fuel supervisor, Canadian National.



Covered Hoppers Built by A.C.F.

Two-compartment cars have capacity of 70 tons and weigh 50,700 lb., light

THE American Car & Foundry Co. has recently completed 25 all-steel covered hopper cars for its subsidiary, the Shippers' Car Line Corporation, which have been leased to the Mathieson Chemical Corporation. These cars, built at the Berwick, Pa., plant, have a nominal capacity of 70 tons, weigh 50,700 lb. light, and are 35 ft. 3 in. long over striking castings. They are built from designs from which a total of 70 cars have so far been built this year for the Shippers' Car Line. The cars are divided into two compartments, each of which has two discharge openings. They are built with outside frame members and all body plates are joined by welding. The roof is riveted and is joined to the body by riveting.

The underframes are built up on A.A.R. Z-26 sections, the edges of the top flanges of which are joined by continuous welding along the center line of the car. The total cross-sectional area is 24 sq. in. The body bolsters are of riveted construction. The web plate is in one piece cut out to fit over the center sill. It extends across the car and is completed with top and bottom chord angles and 18-in. top and bottom cover plates. The bolster is attached to the top of the center sill by angles and to the center-sill webs by pressed diaphragms. Angles are employed for attachment of the ends of the bolsters to the sides of the car. The end slope sheet is supported over the bolster by a 12-in. bent plate supported at the sides by tapered gussets extending up from the top of the bolsters at the sides and riveted to the bent plate at the top. At the center are four angles extending up from the bolsters and attached to the vertical leg of the plate, two in front and two behind. Those in front are bent to extend up the slope.

There is a single center partition between the two compartments. The cross-bearer web extends from the carline at the roof down to the angle-section bottom chords. These extend from the side sill to the center sill and are reinforced by a pressed-steel center-sill separator and a 6-in. crosstie plate under the sills. Angle connectors attach the web to the center sill.

The car side sheets are riveted to the side plates and welded to the side sills. The side plates are $4\frac{1}{16}$-in., 10.3-lb. Z bars continuous for the length of the car. Each side sill is in three pieces. From bolster to bolster, which is also the length of the side sheet, an angle is used. Extending from bolster to end sill at each end of the car is a 12-in., 20.7-lb. channel.

The side posts are all welded to the side sheets, except that the bolster posts are riveted to the ends of the sheets below the slope sheets. The bolster posts are 9-in. 15-lb. channels. The seven intermediate posts are pressed U sections the upper ends of which are closed by covers.

The ends are made up of channel end sills of the same section as the adjoining side sills. The end plate, corner and end posts are of angle section. All end and corner posts are attached to the end plate with gusset and riveted to the vertical web of the end sill.

The hopper compartments are made up of end slope sheets, crossridge slope sheets, inside and outside hopper sheets, the side sheets, and the center partition. Each end sheet starts at the roof carline at the end of the car and continues down to the hopper discharge gates, one on

each side of the center sill. It is welded to the side sheets, to the inside and outside hopper sheets and longitudinal hood. The bolster floor supports and reinforcing members are also attached by welding. The crossridge slope sheets are also welded to the partition sheet, the longitudinal hood, the side sheets and inside and outside hopper sheets. The longitudinal hood in each compartment is reinforced at mid-length by a transverse pressed plate.

The crossridge floor sheets are reinforced with angles welded to the sheets parallel to the longitudinal center line of the car and attached with gussets to the crossbearer.

The hoppers are closed by sliding gates which move longitudinally of the car. The gate frames are welded to the bottoms of the hopper sheets. The hoppers are also reinforced by angles at the sides level with the bottom of the center sills and across both ends by pressed-steel ties which extend across the car and are welded to the hoppers and center sills. Further reinforcement is provided by angles riveted to the center-sill webs and welded to the inside hopper sheets.

The roof is supported by angle-section carlines. The roof sheets are riveted to the carlines with closely spaced rivets and asphaltum paper is applied in all laps except at the side plate. The hatches, eight per car, are formed by welding and are riveted to the carlines. The hatch covers are hinged to swing toward the longitudinal center line of the car when opened. The four covers on one side are held closed by arms attached to a single locking bar.

The materials in the car body, including sheets, bars, plates and strips ¼-in. thick and under the 5/16-in. side stakes are of Copper-bearing steel. Side and roof sheets are Nos. 7 and 11 manufacturer's standard gage steel, respectively. All slope and hopper sheets, including the crossbearer and partition, are made of ¼-in. plate.

The trucks are American Steel Foundries A-3 Ride Control spring plankless, with 2½-in. travel truck springs. The 33-in. one-wear rolled-steel wheels are mounted on axles with 6-in. by 11-in. journals. Both were furnished by Bethlehem Steel. Side frames and bolsters are Grade B castings. Springs and journal box lids are from the American Locomotive Company, Railway Steel Spring Division; the brake beams from the Chicago Malleable Castings Company, and the brake-hanger wear plates from Schaefer Equipment.

The cars are equipped with the AB brake furnished by Westinghouse. The brake rigging is designed to provide a braking power of 75 per cent of the light weight of the car at 50 lb. cylinder pressure, which is equivalent to 18 per cent braking power of the maximum rail load. Hand brakes are of the Miner vertical wheel type. Couplers are A.A.R. Type E, with 6¼-in. by 8-in. rigid shank. They are bottom operated.

THE PRINCIPAL DIMENSIONS OF SHIPPERS' CAR LINE 70-TON COVERED HOPPER CAR

Length inside of body, ft.-in.	29–3
Length over strikers, ft.-in.	35–3
Width over all, ft.-in.	10–1¼
Height rail to top of running board, ft.-in.	12–9¾
Height rail to bottom of discharge outlet, in.	8
Slope of end floor sheet, deg.	50
Slope of crossridge floor slope sheet, deg.	50
Slope of side hopper sheet, deg.	48
Size of discharge openings, ft.	1-1/12 by 2
Size of roof hatch openings, ft.	3 by 3
Distance center to center of trucks, ft.-in.	25–3
Truck wheel base, ft.-in.	5–8
Capacity loaded to eaves, cu. ft.	1,958
Weight, Light (est.), lb.:	
Body	34,300
Trucks	16,400
Car	50,700

Resilient Pads Add to Comfort on Passenger Cars

By F. J. Carty*

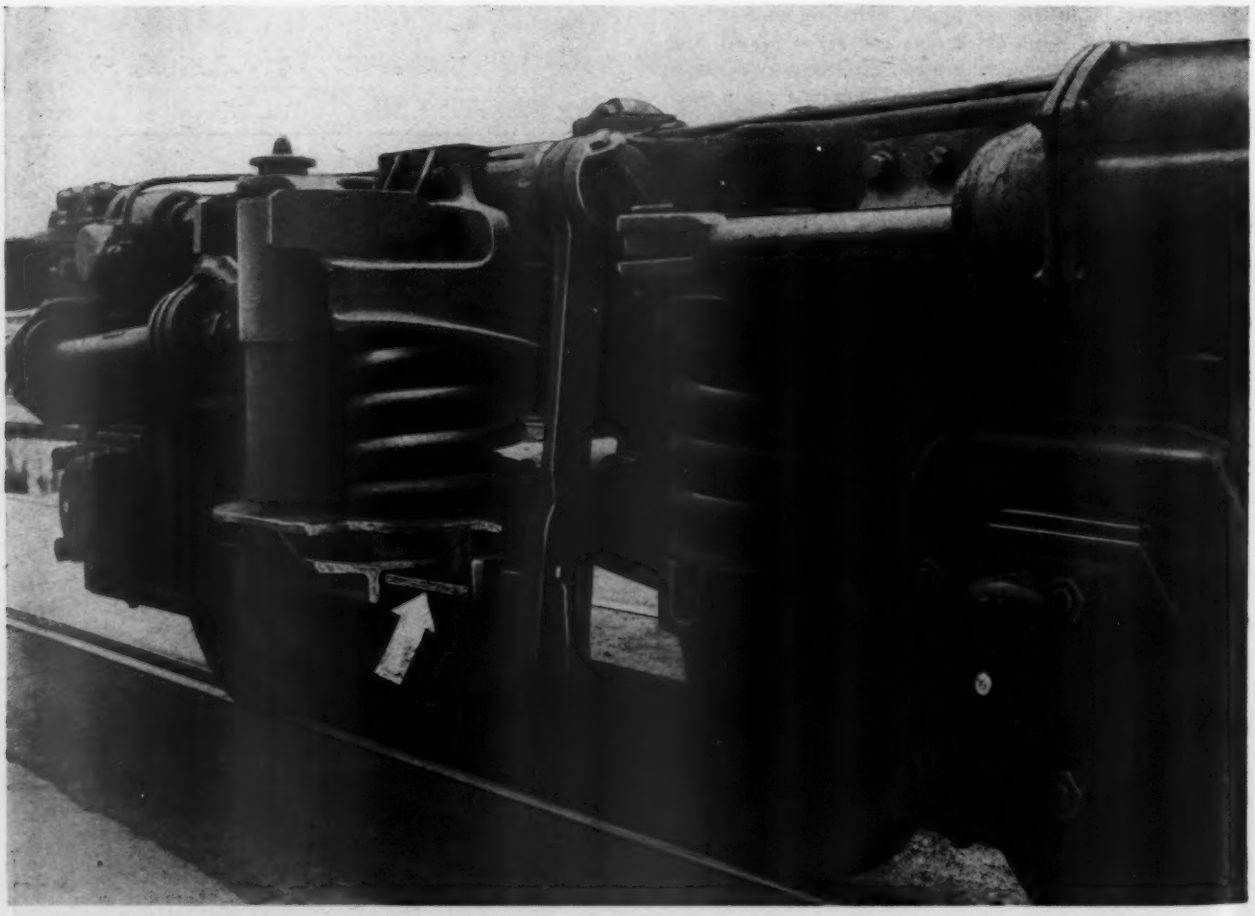
THERE are approximately 40,000 passenger train cars in service on Class I railroads in the United States. During a period of one year, well over 555 million revenue passengers are transported in these cars. Of course, safety is of primary importance in the operation of railroads, but the importance of providing attractive comfortable, easy-riding cars is self-evident as this results in increased passenger revenue.

To attain this desirable condition, many factors must be given consideration, but this article is limited to an outline of the proper utilization of resilient materials, in absorbing impact shocks, isolating high frequency vibration and abating noise on railroad passenger cars.

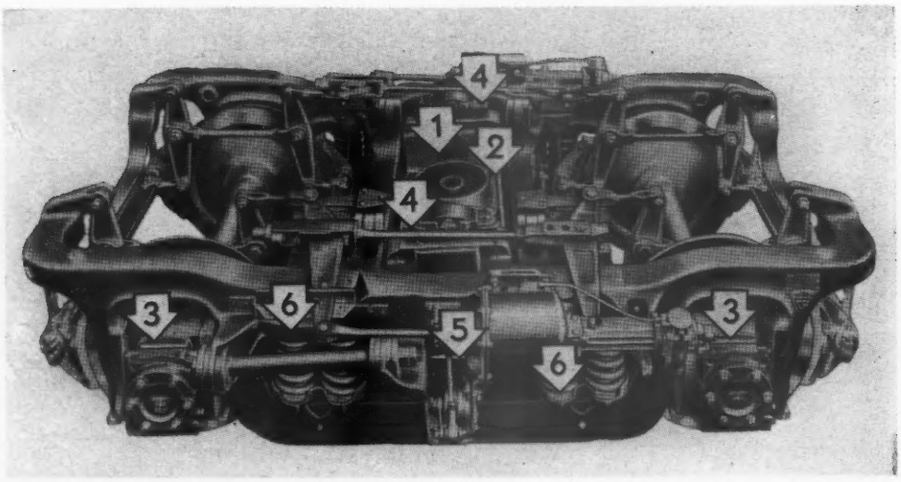
Modern passenger cars are designed to operate at speeds up to 100 m.p.h. and to traverse curves up to 18 deg. which are sometimes encountered in yards, although the maximum curvature of main line track seldom exceeds 6 deg.

When a car is in motion, the rolling of the wheels on the rail generates vibrations and rumble, and the wheels passing over rail ends, crossing frogs and switches sustain impacts or sudden blows. Such impacts also set up vibrations which are transmitted through the wheels, axles, journals, equalizers and springs to the truck frame and then through the transoms to the spring planks, bolsters and center plates to the car body. The major part of the

* Engineer, Fabreeka Products Company.



Spring-plank pads. On swing-motion trucks the bolster springs rest on the spring planks which run transversely underneath the bolsters and are suspended from the transoms by hangers passing under the sprink planks. Spring-plank pads are applied between the top surfaces of the fillers and the bottom of the spring plank. The pads are held in position by downwardly projecting lips of the spring plank



Below: Equalizer and bolster coil-spring pads. Resilient pads are installed at the top and bottom of bolster and equalizer coil springs to reduce metal fatigue and spring breakage and to improve the riding quality of the car

Above: The six principal applications of resilient pads to new passenger car trucks are (1) top and bottom bolster coil springs; (2) center plate; (3) top of journal boxes; (4) under truck side bearings; (5) under spring planks; (6) top and bottom equalizer coil springs. To absorb impact shocks effectively, isolate vibration and reduce noise, the sum of the thicknesses of resilient pads installed at various points between the wheels and car body, should be at least 2½ in. Older trucks can be modernized by substituting resilient pads in place of the wooden or metal shims commonly used to maintain the height of the couplers within permissible limits

cushioning is accomplished by the springs, but as these are metal, high frequency vibrations are transmitted through them.

Lateral play necessary

A limited amount of lateral play is necessary to prevent binding and to allow freedom of movement of truck parts, especially when a car is going around a curve, and it may be pertinent to note that approximately 10 per cent of main line track is curved. On account of the relative movement of the car parts, certain lateral impacts of considerable magnitude occur and these may be considered as acting in horizontal planes. Other impacts, sometimes severe, occur in a fore and aft direction, when there is a sudden change in the speed of movement of the train, due to handling of the engine, application or release of the brakes or when cars are being coupled together.

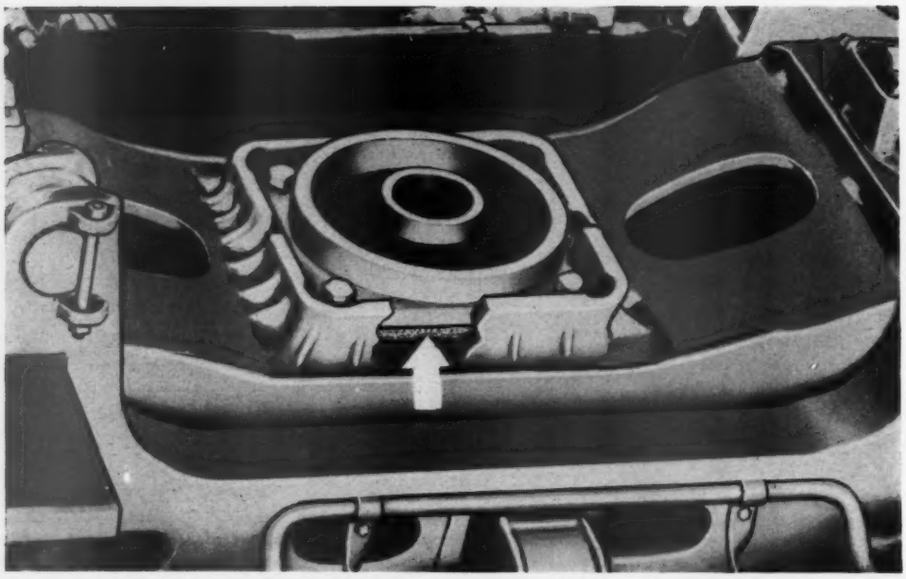
Unless such shocks are cushioned and vibrations isolated, they frequently result in discomfort to passengers, loose bolts, fatigue of metal, breakage of parts and increased cost of maintenance.

Recognized principles of vibration isolation as related to the use of resilient pads, may be considered as depending upon two primary factors: (a) The frequency of vibration to be isolated, that is the forced vibration due to periodic and continuing disturbing forces; (b) The natural frequency of the system, or the rate at which it would tend to vibrate after sudden release from external force.

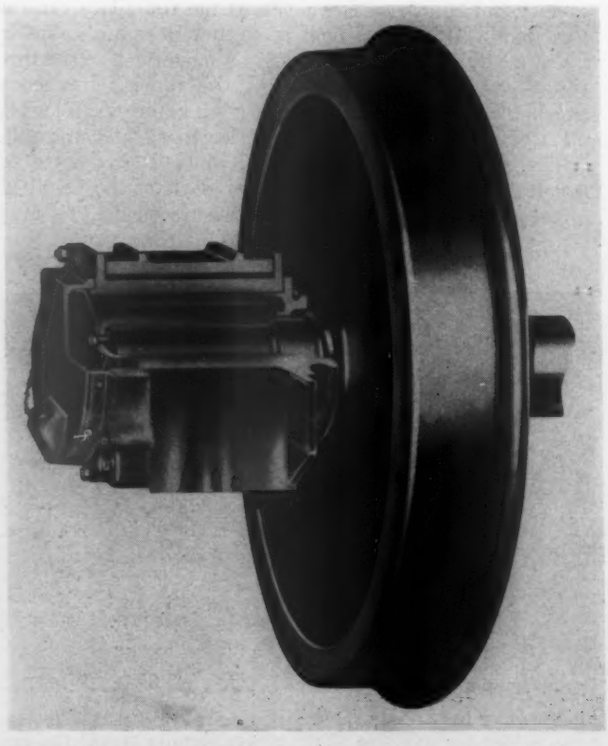
The frequency ratio is the ratio of the forcing frequency to the natural frequency. If the frequency ratio is less than 1.41, the resilient mounting is of no value in isolation of vibration, and may be harmful if resonance results, which is the case when the forcing frequency equals the natural frequency. For good vibration isolation, the frequency ratio should be at least two and one-half.

The elastic internal vibrations, which it is desired to isolate, and which are set-up in car parts as the result of impacts and by the rolling of the wheels on the rail may

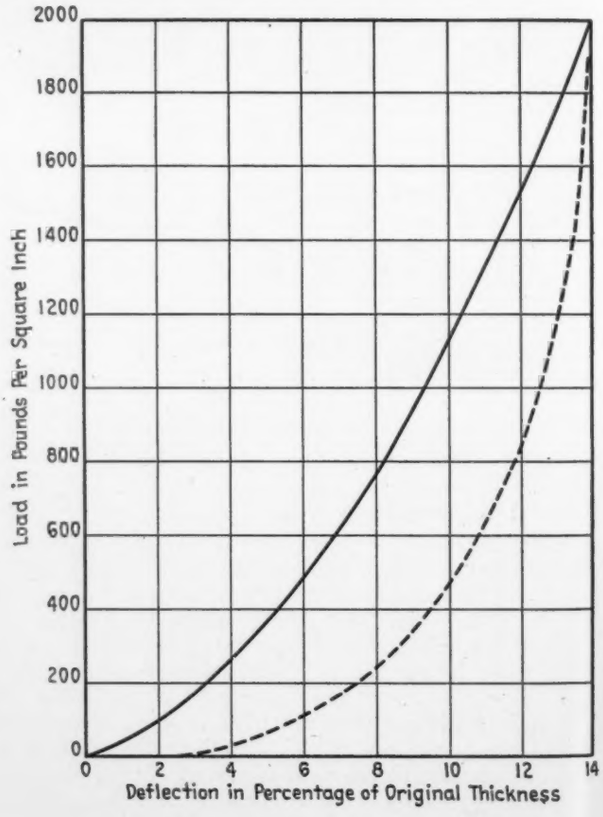
Side-bearing pads. Body side-bearing pads are attached to the body bolster on each side of the center plate to steady the car and prevent excessive rocking while the car is passing around a curve. The resilient pad is placed between the bottom of the side bearing and the top of the truck bolster. Truck side bearing pads are also used to cushion impact shocks, isolate high frequency vibrations and reduce noise



Above: Center-plate pads. It is the practice to design passenger-car truck parts for a center-plate load of 70,000 lb., which means that the pressure on center-plate pads is in the order of 300 or 400 lb. per sq. in. The efficiency of a resilient pad in the isolation of vibration varies directly in proportion to the thickness, but sufficient stability must be maintained. To obtain good service and long life from center-plate pads, they must not be subjected to abrasion; that is, the center plate in contact with the pad must not move horizontally with reference to the resilient pad



Journal-box pads. Resilient pads applied to journal boxes break metal-to-metal contact, cushion ends of equalizers, isolate vibration, reduce noise and, in the case of roller type journal boxes, protect the rollers and races from damaging shocks



Below: Load deflection curve. The solid line is the loading curve; the dotted line, the unloading curve

be assumed to have frequencies of over 100 cycles per second.

To absorb shocks, isolate vibrations and reduce noise, it is important to eliminate metal-to-metal contacts at certain points of the car body and trucks. Designers recognize that this can be accomplished successfully by interposing suitable resilient pads between the metal parts. Such resilient pads must be capable of dissipating energy in the form of heat and have mechanical resistance to vibration conductivity differing greatly from the metal parts.

To give effective and satisfactory service, resilient pads must retain original physical characteristics during long service life and must not be damaged by millions of cycles of loading and unloading. They are required to withstand the action of water, brine, heat, cold and weather conditions generally encountered in railroad service.

Resilient pads store up energy like a spring and when pressure is released, give up this energy without appreciable loss. Their value as vibration insulators depends on this characteristic property.

The measure of resilience is in terms of the energy to produce a deformation and may be judged by the ratio of energy given up on recovery from deformation, to the energy required to produce the deformation.

Load-deflection characteristics should be studied when determining the most suitable and efficient resilient pads for use on railroad passenger cars, as the loading and unloading curves in compression, indicate the ability of a pad to absorb energy. The deflection under load is one of the factors from which can be judged the effectiveness of the pad as a vibration isolator.

The stiffness coefficient and damping characteristics can be determined from the load-deflection curve. The stiffness of a resilient pad is indicative of the degree of deflection which may be expected when the pad is under load, and is a criterion of its value as an isolator. The stiffness coefficient of a resilient pad increases with decrease in thickness.

The progressive reduction of amplitude in free vibration is known as damping and in the case of rubber compounds considered as internal friction, which is inversely proportional to the frequency of vibration. Damping is a force which resists motion and the damping ratio is the ratio of any amplitude to the following amplitude. Experience has shown that resilient pads having a damping coefficient of approximately 1.6 give very satisfactory service on railroad passenger cars.

The set of a resilient pad is the permanent change of form due to repeated or excessive stress, and creep is the additional deformation occurring with elapse of time while the pad is under stress.

To give satisfactory service, resilient pads must retain strength, resilience, and flexibility and must not have excessive set or creep under heavy loads, as this would decrease the natural frequency and might result in loose bolts and misalignment of parts.

Excessive noise is objectionable as it has a detrimental effect on the nervous system of passengers and every practical effort should be made to eliminate it.

When the frequency of vibration is less than 15 oscillations per second, the vibration is a shake or tremor. Between 15 and 30 oscillations per second, the tremor is accompanied by noises or clicks. Vibrations having frequencies greater than 30 oscillations per second are recognized as sound, the amplitude of vibration determining the loudness and the frequency determining the pitch.

Breaking the continuity of the path of sound by interposing resilient pads between metal parts which are being caused to vibrate, is effective in reducing noise. This is one of the more important functions of resilient pads on railroad passenger cars.

The load-deflection curve shown is typical of an efficient resilient pad having a durometer hardness of about 90, composed of layers of tightly twisted, closely woven, light weight cotton duck. Each layer is thoroughly impregnated with a special rubber compound and the layers are built up to required thickness and vulcanized together.

Reclaiming Aluminum Diesel Locomotive Parts*

By La Motte Grover† and R. L. Rex‡

Fig. 1—Cast-iron cylinder heads with cracks veed out, preparatory for welding

CRACKING in cast-iron cylinder heads is still an important problem, despite some improvements that have been made in the design and proportions of such heads. These cracks usually occur from one valve seat (Fig. 1) across to another or to the fuel injection opening, or in the turbulence chamber, or in the inlet and exhaust valve chambers and sometimes at guide-bolt holes.

Although a number of processes and procedures have been tried out by various railroads for reclaiming such cylinder heads, experience indicates that oxyacetylene welding with a molybdenum cast-iron rod and suitable flux (Fig. 2), is in general the most satisfactory process, largely because of its versatility. Some cracks are inaccessible for welding by any other process, and when sand pockets or other rather deep-seated defects are encountered in the castings, the oxyacetylene process is the only one that affords an opportunity for the kind of manipulation of the rod and torch that is necessary for working out such defects.

Satisfactory results have been obtained by the tungsten-electrode inert-gas-shielded arc-welding process (using argon gas and either balanced a.c. current or d.c. straight polarity) for building up worn valve sets and for repairing cracks that are accessible, when no sand pockets or other deep-seated defects are encountered in the castings. However, one cannot foresee the encountering of such hidden defects. Also, it has been found that occasionally a crack that can be reached only with the oxyacetylene welding, is not detected until the heat of welding starts to open it up. Further, when the electrode holder must be inserted in an opening such as an exhaust valve chamber, to reach a crack or defect, the proximity of the surrounding highly preheated base metal will likely result in the holder being damaged by the heat.

The cracks may be veed out by grinding or machining prior to welding, or it may be found more expedient to wash them out with the torch while the welding is being done. Machined carbon plugs with land-shoulders are inserted in all valve openings and in the fuel injection opening, to dam off the deposited metal and to provide for

Fig. 2—Welding a cast-iron cylinder head in an insulated furnace which maintains the 1,400 deg. F. preheat temperature

* Part 2 of an abstract of a paper presented before the American Welding Society. † Welding Engineer, Air Reduction Company. ‡Superintendent of Railroad Service, Air Reduction Company.

sufficient build up of sound metal at the edges of such openings.

With either of these processes the cylinder is preheated to about 1,400 deg. F. and welded in an asbestos lined box or insulated furnace (Fig. 2), the preheating temperature being maintained during welding. The heads are then allowed to cool slowly over a period of at least 48 to 72 hours. Some shops use a longer cooling period. The gas-welded heads are sometimes left to cool in the box or furnace where they are welded, after flake asbestos has been packed around them, and the box or furnace covered. The heads that are welded by the tungsten-electrode method are reheated and then cooled slowly in the furnace or insulated box.

Although metal-arc welding with stick electrodes has been tried for reclaiming these heads, there appears to be no record of experience that would justify a departure from the long-established requirement for preheating and annealing, as outlined above, when welded cast-iron parts are to be subjected to such severe conditions and changes in temperature as those for a diesel head.

After cooling, the heads are machined on a radial drill press or vertical boring mill. Some types of heads require that the entire face be built up by welding to provide for subsequent machining because the general design is such that no appreciable departure from original dimensions can be tolerated.

The reclamation cost of such heads has been reported as varying from 10 to 60 per cent of the replacement cost, depending upon the type of head and the extent of the damage. Long service records have now demonstrated the success of this operation.

Various railroads have encountered no difficulty in setting up and carrying out these cylinder head reclamation operations in a successful manner, but it cannot be stressed too much that a shop should not attempt these operations without going into the matter right. Suitable and adequate equipment must be provided; correct procedures must be established and adhered to rigidly, and competent and specially trained operators must be developed; because there are some unusual techniques and manipulation that are needed at times to assure a dense, nonporous, machinable deposit, and to hold the warping of the cylinder head face to a minimum. In training operators for this work, it is well to start them out on scrap heads that are too badly damaged for reclamation.

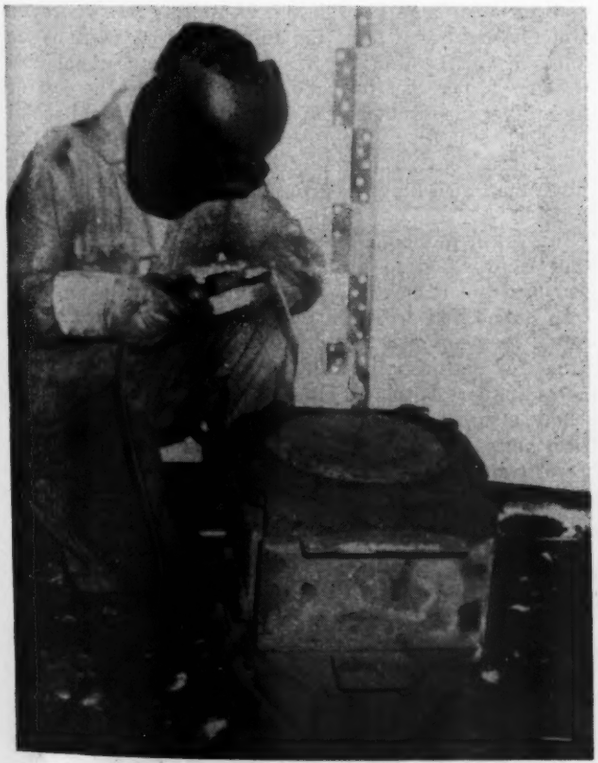


Fig. 3—Arc welding new wear-resistant liners to roller-bearing journal boxes, while precision parts of the bearing are covered to protect them from spatter

Fig. 4—Diesel valve (with a groove cut in seat on a lathe) mounted on a simple powered positioner for hard facing

Cast-Iron Cylinder Liners

When cast-iron liners of diesel cylinders become pitted on the water side of the liner, they are reclaimed by metal-arc welding, using an extruded electrode with a commercially pure nickel core wire. The welding is often done with little or no preheat, using a skip welding technique to avoid local overheating and to keep the heat balanced and distributed so as to minimize distortion.

The pitted areas are first cleaned out thoroughly to bright metal. This can be done most easily with a rotary file.

When the procedure and technique are controlled carefully, the out-of-round distortion after welding can be held to 0.001 in. or less, which is comparable to the tolerance for a new liner. With proper care to avoid excessive welding, no subsequent grinding is necessary.

One railroad has reported the complete cost of this operation as little more than one-tenth of the cost of a new liner.

Roller-Bearing Journal Boxes

Two important reclamation operations are now carried out quite widely on roller-bearing journal box assemblies, by means of arc welding: building up wheel thrust end bearings, and applying new manganese steel or high

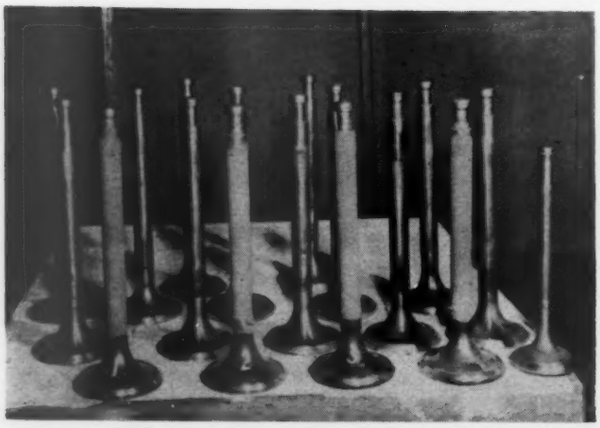


Fig. 5—(above) Valves of various sizes reclaimed by hard facing the seats. The four in the first row have also had the stems built up by metal spraying. Combining the spraying and facing permits efficient salvage of both stem and seat

Fig. 6—(right) Broken diesel engine base in a preheat furnace. The break, outlined in chalk, is beveled and ready for brazing

carbon steel wear-resistant liners on the boxes or on the pedestal jaws of the trucks.

The process of rebuilding thrust bearings for Diesel roller-bearing journal boxes with a lead-bronze wearing face has been in use now for some three years with universally satisfactory results when the proper procedure is used. This process has been used successfully for a much longer period of time for driving box laterals of steam locomoitves.

The first procedure developed for these diesel thrust pads was patterned after the common practice used for driving box laterals. It involved the depositing of two or three $\frac{1}{8}$-in. layers of lead bronze on the worn face of the existing lead-bronze pad, using 200 to 300 deg. F. preheat and a $\frac{5}{16}$-in. lead-bronze self-fluxing bare electrode with about 225 amp. d.c. reversed polarity welding current.

The present trend in practice is to remove the old cast lead-bronze entirely, by the carbon-arc method, down to the cast steel, for the original reclamation, and to build up by arc welding with a phosphor-bronze electrode to within $\frac{3}{8}$ in. of the final standard surface contour, prior to depositing the facing of lead-bronze. This procedure facilitates control of porosity. A certain amount of porosity occurs invariably in depositing a lead bronze by welding, but experience has indicated no adverse effect of the moderate amount that occurs when proper procedures are used.

Subsequent reclamations, after the original reclamation, can usually be made by depositing one or two layers of lead bronze directly upon the worn face, following the original practice, at a cost of about 35 per cent of the cost of a new bearing.

Various other types of bronzes have been proposed and tried out for reclaiming these thrust bearings, but records of experience seem to indicate that these other types, such as the harder manganese and aluminum bronzes, are not suitable for this application.

In welding new manganese steel or high carbon steel wear-resistant liners to roller-bearing journal boxes (Fig. 3) or to the pedestal jaws of Diesel locomotive trucks (or to car trucks), the use of a 25-20 stainless-steel electrode has been common practice in the past. More recently there has been a trend toward the use of a mild-steel electrode with a low hydrogen-type coating which apparently is giving entirely satisfactory results at considerably less cost for electrodes. Further, the low hydrogen content weld metal is more easily removed by chipping, grinding, oxyacetylene gouging or arc cutting, during subsequent liner replacements.

Although the high-tensile strength and hardness of the liner plates, themselves, seems to have suggested to some reclamation departments that a high-tensile strength weld metal of high hardability, as well as low hydrogen content, should be used for this operation there is no apparent justification for incurring the additional cost of some 20 per cent for these electrodes over the cost of the mild steel low hydrogen type. Since the weld metal is deposited as fillet welds merely to attach the liners, the weld metal, itself, is not subjected to wear; so ductility rather than high hardness would be desirable for the weld metal.

In Fig. 3, it should be noted that a covering of some kind is provided to protect the precision parts of the bearing from damage by spatter during the welding.

In connection with the depositing of lead bronze, it should be mentioned that this has been done to a limited extent for restoring lateral-bearing surfaces of traction motor support bearings. After the motor has been completely stripped of windings, armature and other electrical parts, the motor case is set on one end, submerged in water almost up to the end of the collar of the bearing, to keep the rotating bearing part cool while the thrust part is being built up with lead bronze.

However, if the bore or rotating bearing part is badly worn, the entire bearing would be replaced rather than reclaiming the thrust part.

Another operation of reclaiming parts of bearing assemblies is that for traction-motor armature bearing housings, including the commutator-end bearing housing and the pinion-end housing, which work out of shape due to impact, and therefore must be rebuilt and machined to bring them back to standard. A departure of 0.003 in. or more from standard dimensions causes trouble with the armature shaft. These steel housings are rebuilt with an arc-welded deposit of mild steel.

Diesel Engine Valves

Oxyacetylene welding with a low-carbon chromium-cobalt-tungsten, nonferrous alloy has proved to be the most satisfactory process for rebuilding the seats of Diesel valves (Fig. 4). Service records show that such reclaimed valves give 3 to 3½ times the service life of a new valve. Several railroads have proposed to hardface new valves in this manner, before they go into service, because the use of such reclaimed valves has been found to cause no greater rate of wear on the seats in the cylinder head. In fact, the experience of some railroads is that with the use of reclaimed valves, the seats in the head require only grinding in, whereas previously they had required reseating, because of damage that had been caused by worn or distorted valve seats. As a result, these railroads now rebuild all valves by this welding process at the time of first removal of heads for inspection.

A saving of 50 per cent or more in cost has been reported for the reclaiming of these valves, as compared with the cost of new ones.

It is very important that valves to be reclaimed be inspected properly and carefully for cracks before welding. If such cracks exist they can result in serious failures which are sometimes improperly blamed upon the welding. When valve stems are badly worn, they may be turned down in a lathe and then built up with 0.80 carbon steel by metallizing after which they are finished by grinding to standard dimensions, thus making the reclaiming of the valve seats worthwhile.

Engine Bases, Frames and Bodies

In repairing heavy cast-iron structural parts such as engine bases, the general practice is much the same as in the repair of heavy cast-iron parts such as frames of steam locomotives. Braze welding with an oxyacetylene torch has been found to be the most economical process that will afford reliable performance under the usual service conditions and temperatures for such structural parts.

The braze-welding procedure and technique are relatively simple, as compared with gas welding with a cast-iron rod, and therefore braze welding is less critical in application. It has the further important general advantage that a part may often be braze welded, using local preheat, without removing it, whereas gas welding with a cast-iron rod would require that the part be removed for preheating, welding and subsequent slow cooling in a furnace of some kind.

In the case of cast-iron Diesel engine base with a fracture repaired by braze welding, a furnace (Fig 6) was built around the entire base (to preheat to 900 deg. F. with a charcoal fire) and the additional cost of using a cast-iron welding rod with suitable procedure and preheat would not have been as great as it is in many other cases. However, control of the welding operations would have been more critical, and more time would have been required. The physical properties of the braze-welded joint proved to be adequate for the service conditions.

For the repair of damaged steel side frames, underframes, sheeting and other steel body parts, arc welding with ordinary mild-steel electrodes is usually the most suitable and most economical process to use. However, at points where heavy material must be welded under a considerable amount of restraint against weld shrinkage, electrodes with coatings that produce low-hydrogen content weld metal can sometimes be used to good advantage.

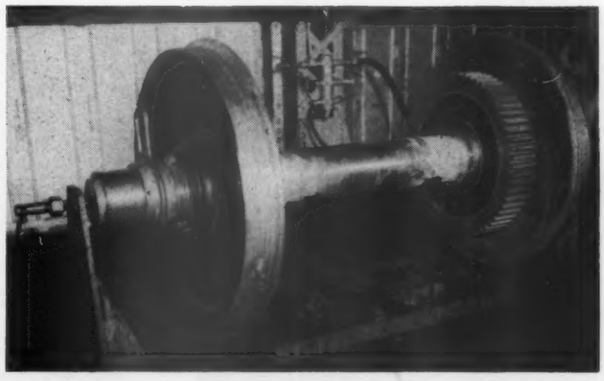
Mild-steel electrodes of Class E6010 or E6012, would be used ordinarily, except in some cases where a butt weld (groove weld) has to develop the full tensile strength of comparatively thick parts of high-strength low-alloy steel. For such cases the use of Class E7010 or E7011 electrodes is frequently recommended. However, it is well to recognize that fillet welds of minimum practical size, made with the less expensive mild-steel electrodes, often will be adequate for the strength requirements. Also, butt welds in thinner material usually pick up enough strength from the low-alloy base metal, to give them adequate strength. When welding must be done at rather low temperatures or with a considerable amount of restraint against weld shrinkage, the use of electrodes that provide a mild steel deposit such as Classes E6010, E6012 or E6016 facilitates control to prevent cracking, as compared with the use of the E7010 to E7011 electrodes.

In most cases of repairs of this kind, the reclamation of the parts can be carried out at a fraction of the cost of replacement, at the same time saving the cost of delays in waiting for replacement parts which are not often available.

Miscellaneous Items of Reclamation Work

As the railroads have become more familiar with Diesel locomotive maintenance problems, applications of welding and the oyacetylene cutting processes have been expanded continuously to include not only the reclamation of major parts such as have been discussed, but also to include many minor items of routine work. Typical of these items are the use of arc welding with a low-alloy chromium-manganese type of electrode to hard face Diesel brakeheads, the use of silver soldering to repair radiators and copper or brass tubing of oil and water lines, and the use of a straight head cutting torch for the removal of pinion gears from Diesel motors when non-destructive methods fail and various other uses of these processes.

The reclamation of Diesel locomotive parts is continually opening up new profitable fields of application for most of the arc welding and oxyacetylene processes. It is especially interesting to note the ever-increasing applications that are being developed for the inert-gas-shielded arc-welding processes, including the newer metal-arc process with consumable filler-wire electrode, as well as the tungsten-electrode process.



The cleaning of locomotive parts so that they be inspected and worked on in the shop is an increasingly important matter with diesel power and the Southern Railway has solved this problem with respect to diesel wheel sets at the Spencer, N. C. shops by a special stand on which nose suspension bearings are also honed

Shop Ideas from the Kansas City Southern

▲ A dolly which moves jacks up to 150-tons capacity

▼ Gib removal on Fairbanks-Morse trucks to replace the equalizer coil spring, which formerly required several hours, has been reduced to less than one hour with this apparatus. The member on top of the jack is slotted to fit around the gib with sufficient clearance to permit the jack to compress the spring enough to free the gib. A nut is permanently welded to the gib to permit its removal by the screw puller at the left

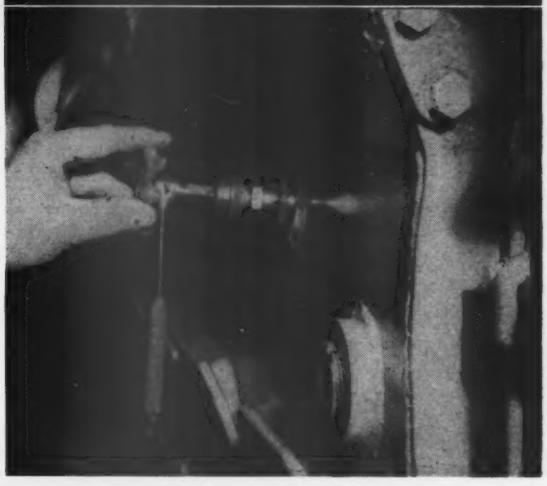
◀ Both transversely and longitudinally mounted air reservoirs, as well as the drums mounted in the nose of E.M.D. A-units, are removed and tested with the above apparatus at the Pittsburgh shops. The body-mounted reservoirs are removed with the cradle shaped to the reservoir contour which is mounted on the shaft of the step jack and which is positioned by a pin for different ranges. Removed longitudinal drums rest on the center rollers for testing. Transverse drums rest on the other set, shown lying slantwise. The latter rollers are also used to test nose-mounted drums in place

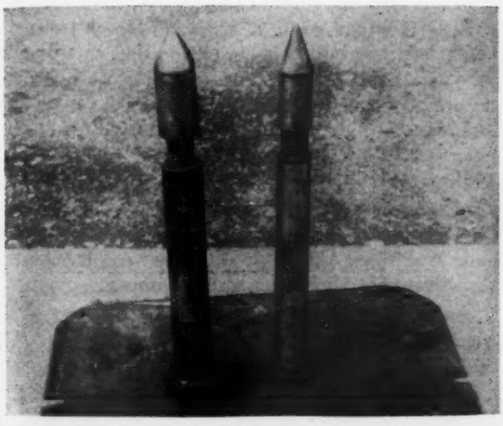
▼ A journal-box lifter with lips that catch under the lateral jaws to hold the box square and prevent turning

▲ Traction-motor-support-bearing changers are located permanently in the pits at the Pittsburgh diesel house and are moved back and forth to where they are needed. One of the drums contains air at 80 lb., which is piped to the second, containing the oil, through a reducing valve which maintains a pressure in the oil-discharge drum from 12 to 20 p.s.i.

← The ½-in. tubing on the end of the rubber hose blows the oil away from the leakage area of an injector in place on a locomotive so that the leak may be seen

▼ Internally threaded cone-shaped devices are put on the end of brake pins to slip the pin through the brake rigging parts, eliminating the need for using a drift pin





▲ A gadget for removing safety hanger nuts. The wrench extension consists of a socket mounted loosely on the handle with a cotter key to take care of slight angular irregularity

▲ A wrench which permits quick removal of relief valves. The handle has an internal hexagon shape which slides over the hex-shaped portion of the handle for final tightening or initial loosening as shown above. During other operations in the removal or application of the relief valve the hex handle slides back over the round part of the shaft below for spinning the valve in or out with the hand wheel

← Binder nut remover has 7:1 reduction gearing and is turned with a ratchet wrench

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives*

Main Frame and Base

288-Q.—What is the purpose of the doors located in the sides of the main base? A.—For inspection work on crankshaft, bearings and other parts.

289-Q.—How does the main base function? A.—The main base also serves as a lubricating oil reservoir for the diesel engine.

Oil Slinger

290-Q.—Where is the oil slinger located and what is its purpose? A.—It is located at the generator end, bolted to the generator adaptor. Its purpose is to prevent oil from leaking by the engine crankshaft into the generator and fan.

291-Q.—How does the oil slinger operate? A.—Centrifugal force throws the oil from the crankshaft into grooves machined in the slinger where it is collected and drained back into the base.

Generator Adapter

292-Q.—Where is the generator adapter located and what is its function? A.—It is mounted on the generator end of the engine and supports the main generator.

293-Q.—What is housed in the generator adapter? A.—The camshaft idler, camshaft gears, supports the oil slinger and carries a portion of the engine weight.

294-Q.—What is mounted on the adapter? A.—The tachometer generator, crankcase exhauster, and lifting eyes for removing the engine from the locomotive.

Engine Turning Device

295-Q.—What is the turning device for and where is it located A.—The engine turning device is for the purpose of rotating the engine by other than its own power and is located at the free end of the engine.

296-Q.—What does the turning device consist of? A.—It consists of two principal parts, the worm assembly and the gear assembly. The worm gear is keyed to the crankshaft extension and secured by a lock washer and nut and the worm assembly is bolted and dowelled to the supercharger support.

297-Q.—How can the engine be rotated? A.—The ends of the worm shaft terminate in a hex on which a hand wrench or motor may be applied so that the engine can be rotated from either side.

298-Q.—How is the turning device engaged? A.—To engage the worm with the worm gear hold the lifting lever and unscrew the locking bolt until the housing is free. Lower the assembly carefully until the gears have made contact, turning the worm slightly if necessary, to get the teeth to mesh. Re-apply the bolt and tighten.

299-Q.—What serves to lock the device in engaged position? A.—The pressure exerted by the spring against the bolt effectively locks the device in engaged position.

300-Q.—How is the timing device dis-engaged? A.—Unscrew the locking bolt until the housing is free. Swing the assembly upwards until the bolt lines up with the threaded hole on the right side of the housing. Lock it in this position with the bolt securely tightened.

301-Q.—What precaution must be taken? A.—Do not start the engine with the turning device engaged.

302-Q.—How is the turbosupercharger support constructed and what is mounted on it? A.—The turbosupercharger support or upper end casing is of steel welded construction. On it is mounted the supercharger, turning device and governor.

Vibration Damper

303-Q.—Where is the torsional vibration damper located and what type is it? A.—It is attached to the end of the engine crankshaft opposite the generator end. This damper is of the viscous type in which some of the vibration energy is absorbed by the work done on the viscous fluid in the damper.

304-Q.—What does the damper consist of? A.—It consists of a hub member with a casing welded to it in which is enclosed a free fly wheel surrounded by silicone fluid. As the damper is completely sealed it requires no servicing.

Lower Casing (Free End)

305-Q.—Describe the lower casing (free end). A.—It is of steel plate welded construction and is located directly below the turbo supercharger support. When these two parts are assembled on the engine they form a housing for the crankshaft accessory gear and damper.

306-Q.—What is supported by the lower casing? A.—The engine water pump and lubricating oil pump and necessary gears to drive the pumps.

Gear Trains

307-Q.—Where are the gear trains located? A.—At both ends of the engine.

308-Q.—How do they function? A.—The gears at the generator end make up the timing gear train which drives the camshafts and governor tachometer generator. The train at the free end drives the lubricating oil and cooling water pumps.

309-Q.—What do the camshaft timing gears mesh with? A.—The helical camshaft timing gears mesh with idler gears engaging the crankshaft gear.

310-Q.—How are the camshaft gears applied? A.—They are keyed and mounted on a tapered fit at the end of the camshaft and are secured by a hex nut bolted and lock-wired in place.

311-Q.—Describe the crankshaft gear. A.—It is of the split type having an upper and lower half, mounted on the crankshaft.

312-Q.—What does the left bank camshaft gear drive? A.—The governor tachometer generator gear assembly.

* This series of questions and answers relate specifically to the Alco-G.E. Diesel electric locomotives.

CRANKSHAFT GEAR (FREE END)

313-Q.—What does the gear train at the free end consist of? A.—A crankshaft gear mounted on the extension shaft, lubricating and cooling water pump drive gears. The gears for both pumps are mounted in a housing attached to the lower gear casing.

314-Q.—How are the pumps driven? A.—The pumps are both driven from their respective gears through a spline arrangement.

315-Q.—Where is the crankshaft timing disc located? A.—It is integral with the worm gear for barring the engine and is mounted on the crankshaft extension just outside the free end casing.

316-Q.—Describe the timing disc. A.—The face is engraved with a line every degree for its entire circumference. The positions in line with the various crank throws are marked by numbering the applicable throw; thus, 1 and 8, 2 and 7, 3 and 6, and 4 and 5 are engraved at their respective positions. Attached to the casing are two pointers 45 degrees apart and marked L.H. and R.H., indicating the top dead center positions of the two cylinder banks.

Schedule 24 RL

Air Brakes

TRAIN CONTROL OPERATION (CONTINUED)

1182-Q.—Describe the connections made and flow of air resulting when the handle of the DS-24 Brake Valve is moved to service position to reduce brake pipe pressure and thus suppress a train control application. A.—The brake valve rotary valve connects passage *15* from the equalizing discharge valve to passage *17*, pipe *17*, passage *17* in the *A-1* Suppression Valve, by check valve *28* and choke fitting *4* to passage *27*, pipe *27* to rotair valve (if used), through rotair valve seat into pipe *7* and the timing reservoir (rotair valve in FRGT position), charging this reservoir.

1193-Q.—In what other way is the timing reservoir connected? A.—To Chamber *A* on the left face of the A-1 Suppression Valve cut-off diaphragm *57* through passage *27* by the reduction insuring valve *32*, through choke fitting *35* into passage *26* by double check valve *16* and into chamber *A*.

1184-Q.—What other connection is made with the brake valve rotary valve in service position? A.—Brake pipe air is connected to the A-1 Suppression Valve diaphragm *57* through passage *2* and *26* in the brake valve, pipe *26*, passage *26*, by double check valve *16* into chamber *A*, also through choke *35* to atmosphere choke *36* and passage *27*.

1185-Q.—What movement then takes place? A.—Cut-off diaphragm *57* will move to the right compressing spring *29* and allowing suppression cut-off valve *80* to close.

1186-Q.—What results from closing cut-off valve 80? A.—This prevents venting of air from the brake application piston *112* through passage *10*, pipe *10*, pipe *4*, timing valve pipe *5*, pasage *6* of the A-1 Suppression Valve by cut-off valve *80* into passage *42* and the stop reservoir to permit a temporary suppression of a train control application.

1187-Q.—What happens if the automatic brake valve is placed on lap? A.—After the brake valve is placed on lap, the brake pipe air is cut off from the suppression valve pipe *26* but will continue to reduce past the equalizing discharge valve until it is less than the pressure in the equalizing reservoir.

1188-Q.—What is the movement after the equalizing valve closes? A.—As the brake pipe pressure drops after the discharge valve closes, the automatic timing reservoir pressure drops with it, down to *35* lbs., through spring loaded check valve *23* back into passage *17*. At about *35* pounds, check valve *23* seats.

1189-Q.—What then will be the result? A.—A train control application.

1190-Q.—Explain how a train control operation is brought about. A.—It will require about 10 seconds for the pressure on the cut-off valve diaphragm to reduce approximately *11* pounds, which will allow cut-off diaphragm *57* to move toward the left, open cut-off valve *80* and cause a train control operation.

1191-Q.—How can additional temporary suppression be obtained? A.—Further reduction of brake pipe pressure will permit additional temporary suppression.

1192-Q.—What happens if the rotair valve is in PASS position? A.—First suppression and timing reservoirs are cut out.

1193-Q.—Is temporary suppression available? A.—Only in service and lap positions while the brake pipe exhaust is blowing.

1194-Q.—What will cause a permanent suppression? A.—A full service reduction.

1195-Q.—Explain how this is accomplished. A.—Brake pipe pressure in chamber *C* will reduce enough for suppression reservoir *19* pressure in chamber *D* to move reduction insuring valve *32* and connect brake pipe *1* through the reduction insuring valve to passage *26*, choke *35* and double check valve *16* to chamber *A* and permit a permanent suppression in either freight or passenger service.

1196-Q.—With the rotair valve in FRGT position and first service position of the brake valve used, can a temporary suppression be obtained? A.—Yes.

1197-Q.—Explain how a temporary suppression is obtained under the above conditions. A.—The first suppression reservoir is conected to chamber *A* of the A-1 Suppression Valve through passage *33*, rotair valve seat, passage *23*, pipe *23*, passage *22*, rotary valve *216*, passage *26*, pipe *26*, by double check valve *16* and into chamber *A* closing cut-off valve *80* and causing a temporary suppression.

1198-Q.—What will happen in about 20 seconds if authorized speed or clear signal do not prevail? A.—A train control application will occur.

1199-Q.—Explain the action taking place to cause a train control application. A.—The air also flows through choke *35* and reduction insuring valve *32* to exhaust choke *36*, which in about 20 seconds (with brake pipe pressure at *70* pounds) will reduce the pressure in chamber *A* enough to allow spring *51* to open cut-off valve *80* and cause a train control application.

1200-Q.—What must be done at the end of 20 seconds time if a restricted condition still exists? A.—The brake valve handle must be moved to service position for further partial or permanent suppression depending upon the amount of brake pipe reduction.

ELECTRICAL SECTION

Diesel Wheel Slippage*

New York Central's investigation indicates that a considerable saving in damage to locomotive equipment can be realized by providing the engineman with reliable indication of wheel behavior

By F. Thomas†

THE New York Central has been conducting an investigation of diesel wheel slippage that has continued since the early part of 1946. During this period, much valuable data has been accumulated and a number of railroads have been sufficiently interested in the results to ask for copies of the data. This paper is intended to give a resume of the tests and answer the many requests for information concerning them.

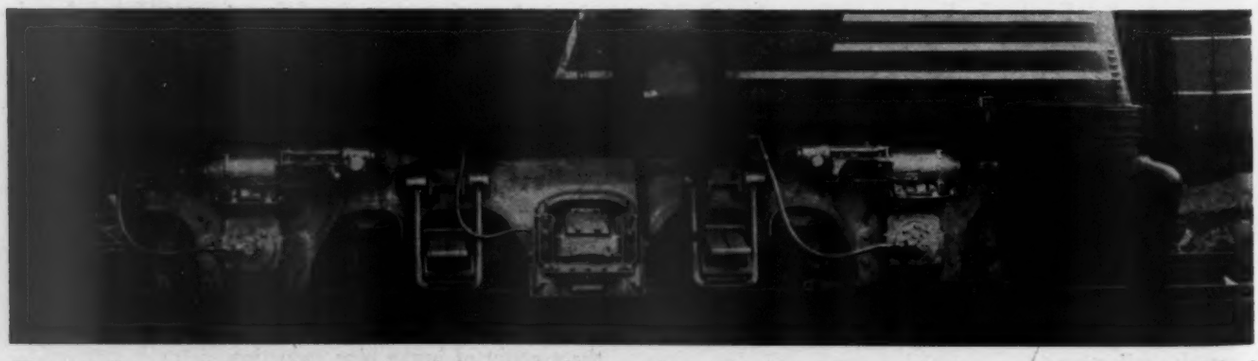
The investigation of wheel slippage was started when analysis of unexplained motor difficulties, flashovers and other troubles associated with the tractive equipment of our diesel-electric locomotives pointed to wheel slippage as a contributing factor. There were numerous observations of loss of power on the ammeter that were eliminated by momentarily notching back the controller,—indicating that wheel slippage existed, even though the wheel slip light did not operate. There were other instances on the road where the wheels were observed to be slipping without causing an operation of the wheel slip light.

To check further on the possibility of wheels slipping without operating the wheel slip control circuit, we examined a number of tapes from speedometers driven by power axles of freight locomotives. The wheel slip relay in use on the units at that time obviously did not function on many of these slips. There were also cases where severe rail damage occurred, because enginemen permitted wheels to slip unknowingly while trying to start a train.

The next step in the investigation,—about September, 1948,—was to change the drive of the recording speedometer from the idler axle to the No. 1 power axle on two passenger units for test observation. It was assumed this pair of wheels had frequent slippage and would give a good speedometer tape record of any slipping condition. The records of wheel speed during the next several months showed that the extent of wheel slippage was even greater than expected.

There were numerous instances in regular service where the slipping wheel spun to speeds in excess of 120 m.p.h., which was the highest the recorder would register. Continuous slippage at such speeds occurred for distances as great as 34 miles as measured on the tread of the slipping wheel. Recorder tapes were obtained where a pair of slipping wheels in effect traveled as much as 60 additional miles in a single division of 146 miles.

Continuing the investigation, a second recording speedometer was added to the diesel units at the axle powered by No. 2 traction motor, (March, 1949). This recorder was equipped with an extra pencil to register operations of the wheel slip light circuit. From the second recorder,



The recording speedometer drives as installed at each driving axle on the locomotive to obtain a continuous test record of wheel behavior. (Locomotive No. 4026)

* Paper presented before the Locomotive Maintenance Officers' Association, Chicago, Ill., September 17-19, 1951.

† Assistant to General Superintendent, Equipment, Diesel-Electric, New York Central.

One of the diesel locomotives used in connection with the New York Central wheel slip investigation

it was possible to determine whether or not simultaneous slippage of driving wheels in the same truck occurred frequently. This was found to be the case. It was also determined that the wheel slip circuit often did not function and no light warned the engineman.

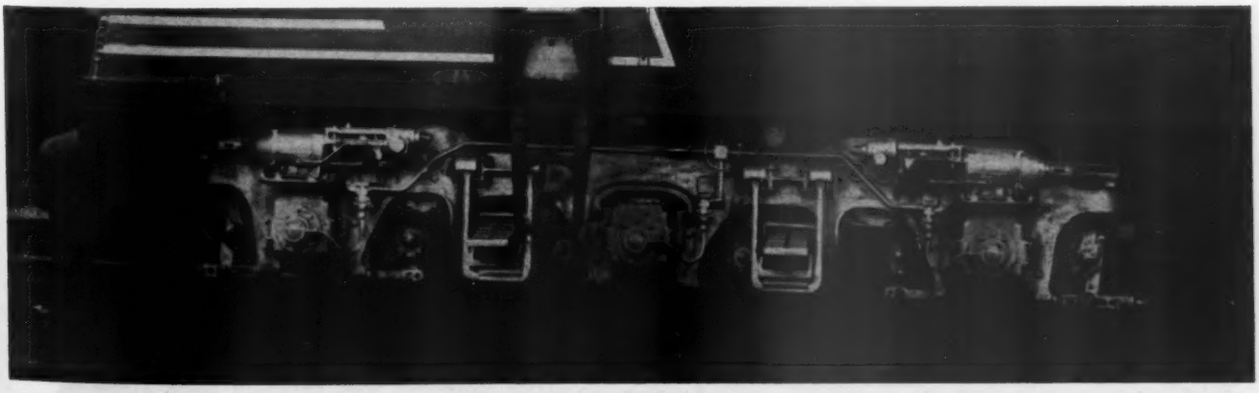
The above phase of the investigation extended from early 1948 through 1949, and in August, 1950, the other two driving axles of the diesel units were equipped with recording speedometers. Throughout the investigation, considerable work has been done on a number of types of wheel slip relays and their connections. In fact, the New York Central has tried all the slip relay combinations suggested by manufacturers. At present, there are more than 20 diesel units on the New York Central operating with experimental wheel slip relays.

While some improvement has been obtained in wheel slip detection, the results are still far from satisfactory by this method, particularly at high speeds. We have about reached the conclusion that the sensing of wheel slippage by relays in the motor circuit is fundamentally unreliable for certain conditions, including wheel slide.

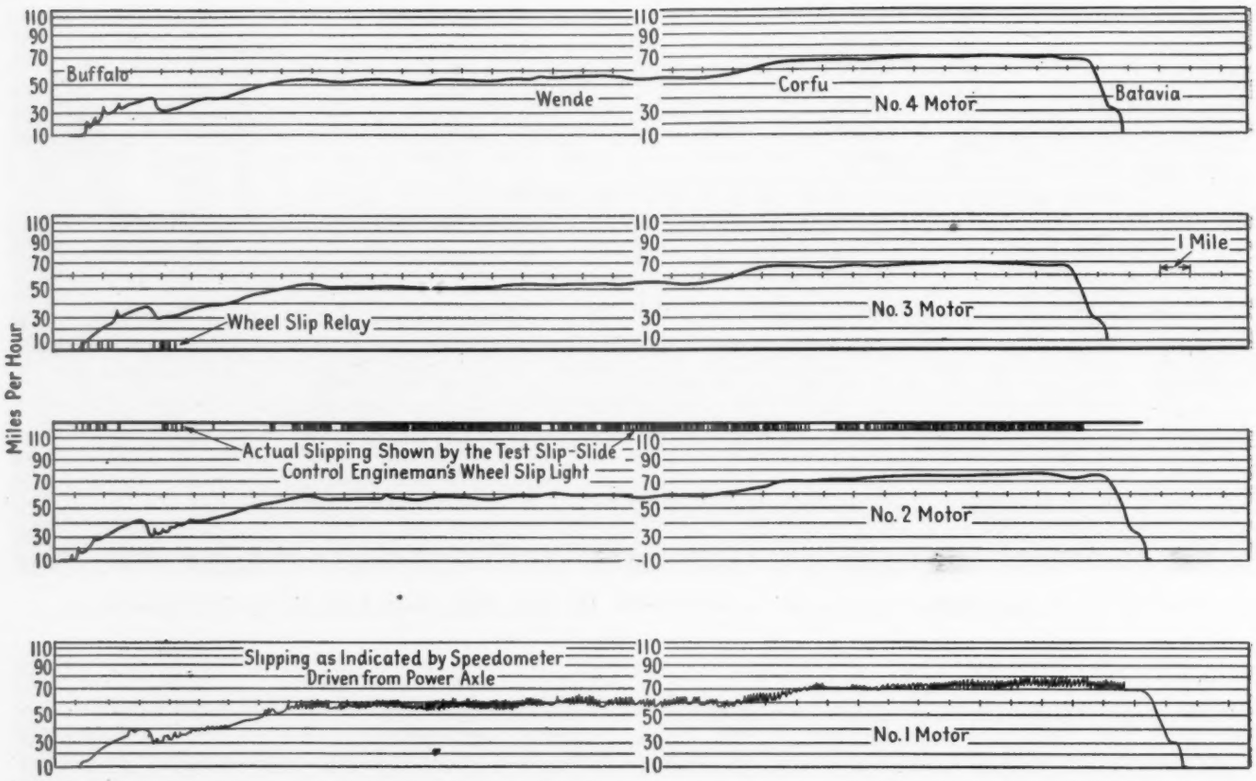
We had been investigating various types of slip relays for about four years when the A.A.R. committees directly interested in diesel locomotives were asked by the Interstate Commerce Commission to investigate devices which would sound an alarm if a wheel became locked. This condition had caused several accid nts. It was suggested that such wheel protective equipment should be independent of the circuits on the unit, so that wheel protection would be maintained at all times, even when the power plant was cut out.

In January, 1950, the A.A.R. Electrical Section Sub-Committee went on record that: "It was the opinion of the Committee that a device for protection of wheel slide should also incorporate protection for wheel slip with a view not only to simplifying equipment on the locomotive but that a device actuated by the action of the wheel itself would be more reliable than the present type of wheel slip protection or other devices that are not directly actuated by the rotation of the wheel."

Among the several devices suggested to the committees was a wheel control equipment which had been used for a number of years on passenger cars to protect wheels from sliding during braking. It appeared that an adaptation of this wheel control equipment could be made to afford the desired locked wheel alarm for all wheels and in addition provide an improved spin detection and an indication of wheel slide from braking. This equipment



The axle-driven wheel controller rotary switches as installed to protect each pair of wheels on Locomotive No. 4026



Example of excessive slippage corrected by the axle-driven wheel controller actuating locomotive wheel slip circuit in place of the regular wheel slip relays, but with circuits otherwise the same. This illustrates the tendency for slippage to occur under certain conditions as power is reapplied. (Train No. 52, Division—Syracuse, direction—Eastbound, trailing unit

is comparatively simple and consists of a commutator-type rotary switch driven from each axle, and a control with one relay per pair of wheels protected.

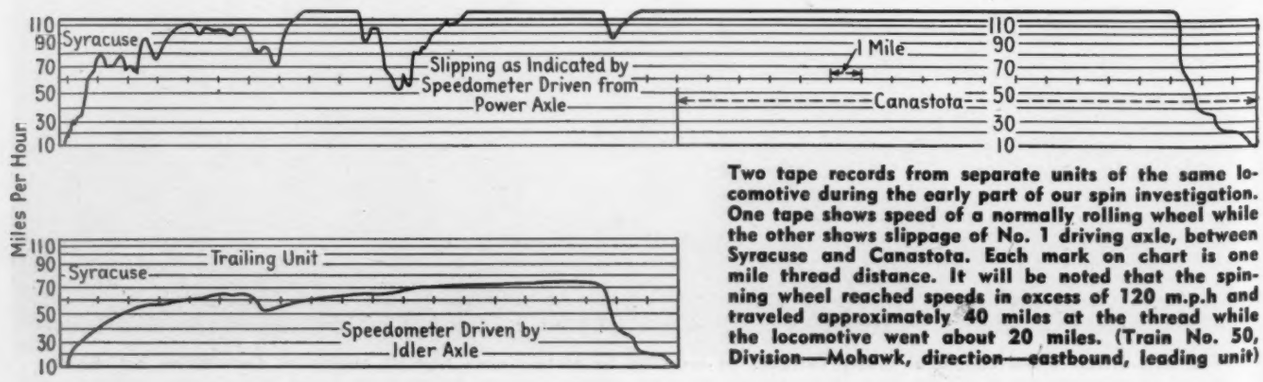
The New York Central agreed to apply that equipment to two diesel units for test report results to the A.A.R. committees. The Pennsylvania and Chicago and North Western have also applied similar equipment for test.

The test of the equipment was considered by the New York Central as a continuation of the original spin investigation. Application of this wheel protective device was made September, 1950, to one of the diesel units equipped with recording speedometers on each power axle. To date, ths wheel protective equipment has been in operation for approximately 298,047 miles on one unit and some 239,975 miles on the other. These units have received only routine service attention.

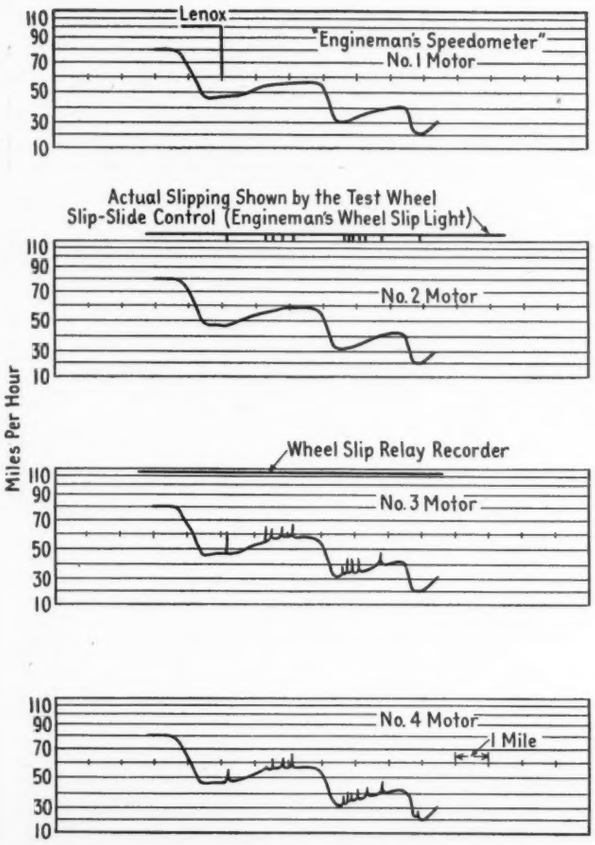
The test of this wheel protective device was made in two parts. First, the wheel control recorded its detection of slips or slides on the speedometer chart, but was not connected to actuate the locomotive slip control circuit. This proved the reliability of the device, as all slips exceeding 7 m.p.h. were detected.

During the six months trial period (September 16, 1950, to March 26, 1951) records were taken from 173 runs covering 1,017 divisions. In this service, the wheel controller on test detected all slips, totalling 3,919. The regular slip relay of the newest type detected 1,033, or 26 per cent of the total, leaving the locomotive without spin protection for 74 per cent of the slips which occurred. In addition, the wheel control device indicated a case of locked wheels caused by an armature band wire failure, and a case of sliding wheels due to braking.

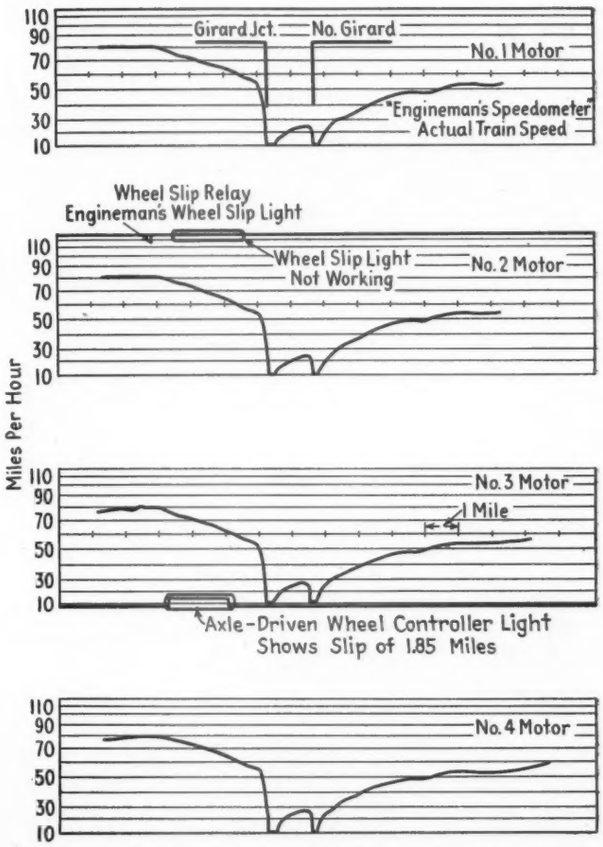
During the second part of the test, the wheel control device was connected to actuate the locomotive slip con-



Two tape records from separate units of the same locomotive during the early part of our spin investigation. One tape shows speed of a normally rolling wheel while the other shows slippage of No. 1 driving axle, between Syracuse and Canastota. Each mark on chart is one mile thread distance. It will be noted that the spinning wheel reached speeds in excess of 120 m.p.h and traveled approximately 40 miles at the thread while the locomotive went about 20 miles. (Train No. 50, Division—Mohawk, direction—eastbound, leading unit)



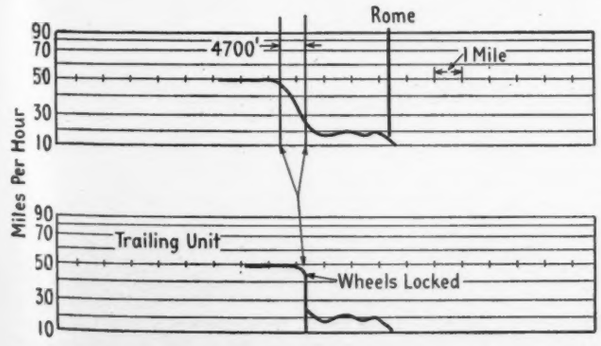
Example of slippage correction after change in locomotive circuit to reduce power momentarily at reapplication. Note that tendency for slippage to recur as power is reapplied has been eliminated. (Train No. 11, Division—Illinois-St. Louis-West, Direction—westbound, leading unit)

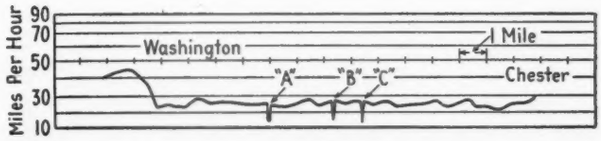


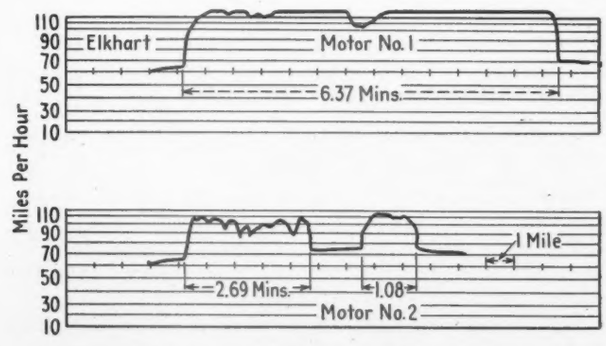
Sliding wheels due to broken traction motor armature band wire on No. 3 motor of trailing unit of test locomotive. Note that the axle-driven wheel controller indicated entire time wheel was locked, whereas regular wheel slip light gave no indication. (Train No. 1/26, Division—Erie, direction—eastbound, leading unit)

trol circuit. Also in this phase of the investigation, several variations of the slip control itself were tried to determine what improvements, if any could be made in the control of slips after the condition was positively detected by the wheel controller.

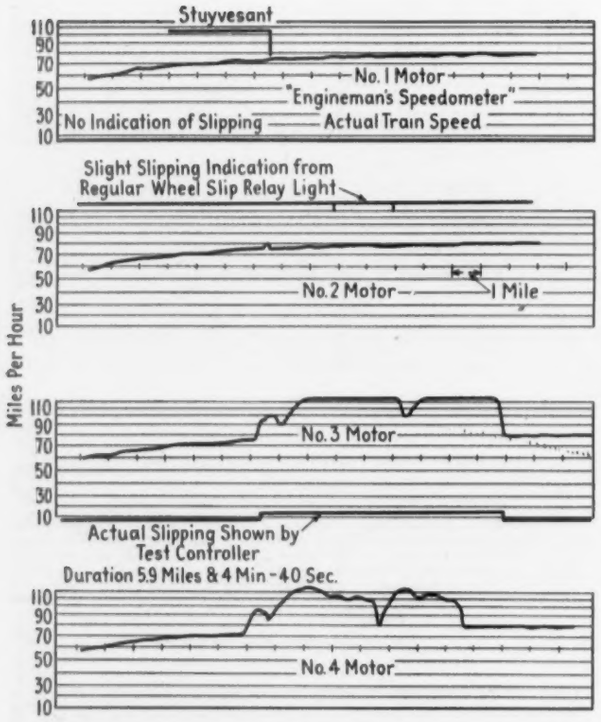
First, with the wheel control device operating in place of the regular wheel slip relay, but with the locomotive slip control circuit otherwise the same, the records indicated that all slips were controlled before the wheel spin exceeded rail speed by about 10 m.p.h. The duraction of a slip control was about two seconds. Usually, there was no operation of the wheel slip relay, which was discon-



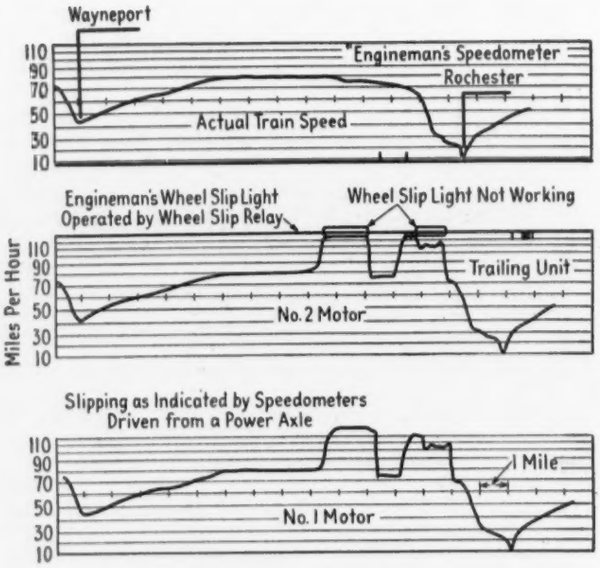
Example of wheels locked during braking possibly due to simultaneous use of dynamic and independent air brake on a freight locomotive. (Train No. BC-1, Division—Mohawk, direction—westbound, leading unit)

Three examples, A, B and C where motor-driven wheels slipped toward a locked condition due to excessive dynamic braking on a freight locomotive. Speedometer on a power-driven axle. (Train No. BA-2, Division—Albany, direction—eastbound, leading unit)



Another example, near Elkhart, Indiana, shows a wheel spinning for six and a half minutes at more than 120 m.p.h. for a tread distance of about 14 miles. (Train No. 68, Division—West Toledo, direction—eastbound, leading unit)



Tapes showing typical indication of slip by the axle-driven wheel control device which was not yet connected to the locomotive control circuit. It will be noted that the entire duration of the slip was recorded. Whereas only slight indication of condition was obtained from wheel slip relay. (Train No. 21, Division—Hudson, direction—westbound, leading unit)



These tapes show examples of simultaneous slippage of the two motor-driven wheels in the same truck. (Train No. 1, Division—Syracuse, direction—westbound, leading unit)

nected from the locomotive control circuit and attached to a pencil on the speedometer chart. The failure of the wheel slip relay to function was probably due, in many cases, to the prompt detection of the slip by the axle-driven device.

With this arrangement, however, the records showed the wheels often slipped again as the power was reapplied after a spin correction. On one occasion, with the locomotive operating between 60 and 70 m.p.h., it was necessary to control 296 slips in 28 miles. We believe this was due to the arrangement of the locomotive circuit, which permitted reapplication of full power too soon after a slip correction.

As another step in the investigation, means were applied to the locomotive circuits to momentarily reduce the power after a spin correction. This eliminated the tendency for recurrence of wheel slippage, and still permitted prompt reapplication of power. To date, this combination of axle-driven wheel slip detection and locomotive control circuit has given the best performance of any tried.

Summarizing the results of our wheel spin investigation, a few statements can be made:

1. The existing wheel slip relay does not afford complete protection against locomotive spin.
2. Speeds obtained during slippage often exceed by as much as 50 per cent the limit recommended from the standpoint of stress on equipment.
3. Spinning of diesel wheels occurs on trailing units as frequently as on lead units, if not more often.
4. The engineman is often unaware of spin due to absence of slip light indication.
5. Wheel slippage occurred on all parts of the railroad. Weather influence on rail conditions is the controlling factor.
6. Axle-driven wheel protection has proved the most effective method to date for controlling wheel slippage.
7. Since the locomotive slip control circuits have been actuated from the axle-driven wheel control device, we have not experienced ground relay action due to spinning of wheels in approximately 104,000 miles. Prior to that period frequent ground relay action occurred.
8. It is believed that considerable saving in damage to locomotive equipment can be realized by providing the engineman with reliable indication of wheel behavior under all conditions.

Application of a two-way radio, mounted on a fork-lift truck which permits communication between the driver and a central dispatcher. A recent Motorola development, it is designed for use on intra-plant vehichles to speed movement of materials. It can be operated from 6 or 12-volt d. c. or 117-volt a. c. power sources

Diesel unit with side panels removed showing visitors inside filing past slowly turning diesel engine, having sections removed to show operation of moving parts

Exhibit Train Power Supply

Two sources of power were used to supply the electrical requirements of the Erie Centennial Exhibition Train which recently completed a highly successful 54-day tour over the lines of the Erie, visiting over 100 cities. One of these was the a.c. generator on the E.M.D. diesel-electric locomotive unit used to haul the train between exhibit points. This generator is normally used to drive the blower fan motors at variable speeds proportional to the speed of the engine. To supply power to the exhibit train, the engine was run on the fourth throttle notch with full field on the a.c. generator. Under these conditions, it supplies 38 kw., 3-phase a.c. power at 110 volts 63 cycles.

One of the sets of three reflector-flood lamps mounted in marker lamp brackets for night lighting. At the left is one of the loudspeakers used for music and announcements

Three dry-type transformers, connected delta-delta, mounted on the end of the locomotive were used to step this up to 3-phase, 220-volt, a.c. power for the train. Also 2,250 watts for outside lighting was taken directly from the generator at 110 volts.

The second source of power were two General Electric G M G 15A3 undercar diesel power plants loaned to the railroad for this purpose and mounted inside a baggage car. Cooling radiators were placed longitudinally on the floor of the car between sliding side doors which were open when the machines were in operation. These machines were capable of developing 50 kw. of 220-volt, 3-phase, 60 cycles, a.c. power. They were used to supply air conditioning and lighting on three cars equipped with axle-driven motor generator sets. The generator on each of these cars also supplied the lighting needs of a second car connected to it through the train line.

The G. E. undercar power plants also furnished 10 kw. of 110-volt power for inside and outside lighting through step-down, dry-type transformers. Power from the power

plants was distributed through the train by 220-volt, three-conductor portable cable, secured under the cars.

Outside lighting for exhibiting the train at night was provided by clusters of three reflector-flood lights, mounted in the marker lamp brackets on the ends of the cars. A number of 48-in., 40-watt fluorescent lamps of various colors were also used to light the trucks of a diesel B unit with removable side panels which were taken off during exhibits to open all of one side.

A coach used as a museum car had a large lighting load which was supplied from the 220-volt, three-phase cables through a dry-type transformer mounted on the car. Steam was supplied to the train by the oil-fired steam generator on the locomotive.

There were 19 units in the train. These were as follows:

1. A 1,500-hp. E.M.D. diesel-electric locomotive which hauled the train and supplied steam for air conditioning three cars and a part of the electric power.

2. A diesel-electric locomotive with removable side panels and an engine with cutaway sections so that slowly moving parts could be seen directly, and by the aid of mirrors. The engine was driven by a back-geared motor mounted in the space normally taken by the generator armature.

3. A diesel training car used by the railroad for the instruction of employees who operate and maintain diesel-electric locomotives.

4. Erie coach No. 1017 with steam-ejector air conditioning. This car was equipped with two P.A. loudspeakers to bring music to the car and permit the making of announcements.

5. A diner also having steam-ejector air conditioning. This car was also fitted wih loud speakers.

6. A Pullman with bedrooms, roomettes and open sections equipped with mechanical air-conditioning. Speakers were also included in this car.

7. A Pullman for the use of working crew. There were at times two of these cars depending upon the needs of the crews and the availability of outside facilities.

8. A diner for working crew. This car was equipped with propane gas for cooking.

9. The baggage car having the two diesel-electric power plants. This car also carried tools and spare parts, and booklets and pamphlets for distribution to visitors.

10. An army tank on a flat car.

11. A high and wide exhibit flat car.

12. A box car equipped to show use of lift trucks and methods of lading. It was equipped with electric lights for night showing.

13. A refrigerator car also electrically lighted for night showing.

14. A flat car on which was mounted a "Standard" locomotive built in 1851.

15. A baggage car of the vintage of 1851, mounted on a flat car; not lighted inside.

16. A centennial coach; also not lighted.

17. A flat car carrying an effigy of Daniel Webster in a rocking chair.

18. A museum car consisting of an electro-mechanical air conditioned coach with seats removed. The lighting load in this car was carried on the circuits used for outside lighting.

19. A radio-equipped caboose. The radio was used to communicate with the diesel locomotives, other trains and way stations, as needed in transit and for demonstration purposes during exhibitions.

Left: Rear end of the diesel locomotive used to haul the train showing dry-type transformers used to raise 110-volt a.c. generator power to 220 volts for driving motor-generator sets on cars. Right: Inside of baggage car. One of the undercar power plants. Radiators between doors. Second unit is beyond the doors. The control equipment is on the wall at the left.

DIESEL-ELECTRICS—How to Keep 'Em Rolling

4 Running Maintenance of Commutators*

Only when the purpose of a commutator and its construction are understood, can it receive the kind of attention it must have

THE commutator is a vital part of every d.c. motor or generator. Hence, it deserves the very best of care. The fact that a commutator usually begs for maintenance by showing signs of trouble long before it actually fails is a big help to the maintainer. If you are able to recognize these signs and know what to do, you can often correct the trouble before it gets more serious. The more you know about how a commutator is made, and what it does, the better running maintenance you can give it.

* This is Part I of the 4th of a series of articles on maintenance of diesel-electrical equipment. This article is written by J. W. Teker and J. R. Schrecongost, both of the Motor Engineering Division, General Electric Company, Erie, Pa. Part II on the subject of commutator maintenance will appear in the December 1951 issue of *Railway Mechanical and Electrical Engineer*.

How a Commutator Is Constructed

As shown in Fig. 1, a commutator is made up of alternate copper and mica segments. The copper segments are often called "bars", and the mica segments are usually called "side mica". The side mica separates the bars electrically. The bars are wedge-shaped so that when assembled they form a cylinder. Each bar usually has a riser to form the connection with the armature coil. The bars are clamped between the shell and cap. Tightening the cap bolts moves the cap toward the shell. This causes the jaws to clamp the bars and pull them together to form a rigid cylinder. Mica cones prevent the shell and cap from short circuiting or grounding the bars. The side mica is undercut below the surface of the bars. This is done because mica wears more slowly than copper under the sliding action of the brushes. So, if it were not undercut, it would interfere with the brush contact on the commutator.

We may divide the work of the commutator into three parts. A study of Fig. 2 will serve to make this plain:

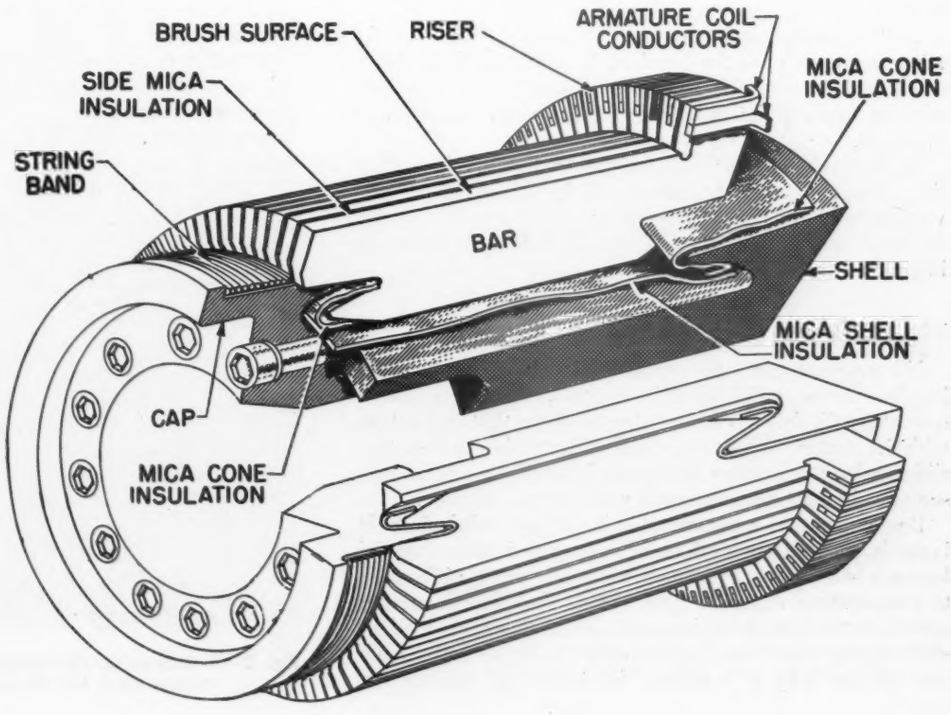


Fig. 1—Cutaway section of a commutator showing how it is put together

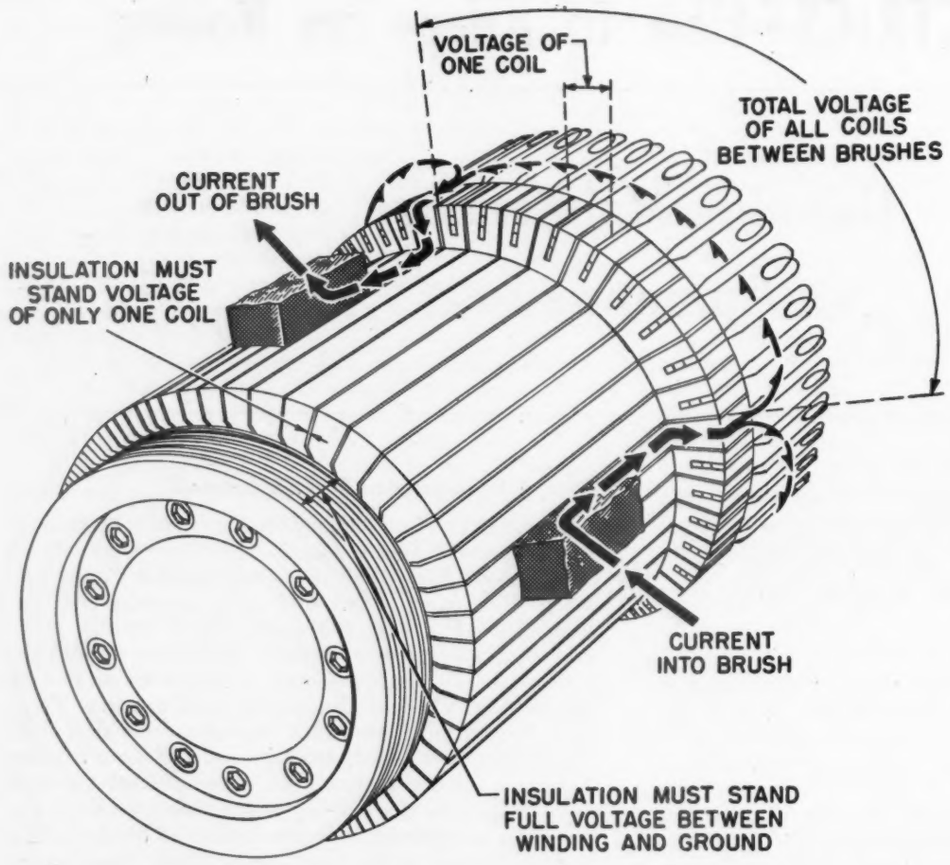

VOLTAGE OF ONE COIL
TOTAL VOLTAGE OF ALL COILS BETWEEN BRUSHES
CURRENT OUT OF BRUSH
INSULATION MUST STAND VOLTAGE OF ONLY ONE COIL
CURRENT INTO BRUSH
INSULATION MUST STAND FULL VOLTAGE BETWEEN WINDING AND GROUND

Fig. 2—The commutator must act as a reversing switch changing the alternating currents developed in the armature to the direct current in the exterior circuits

1. It provides the required sliding electric contact between the fixed brushes and the moving armature. Current enters the armature winding through a set of brushes. It then divides and follows two paths. When it reaches the next set of brushes, it leaves the armature. One such path is shown complete in Fig. 2.

2. The commutator acts as a reversing switch. As the armature coils pass the brushes, it switches them out of one circuit into another. This means that all the coils have current flowing through them in the right direction at all times.

3. The commutator also brings to the brush surface the voltage of each armature coil in the circuit. These voltages add up bar by bar between brushes. As a result, the total operating voltage of the machine appears at the brushes.

The All-Important Surface

No commutator can work as it should unless the brushes make good electric contact. This requires a smooth, cylindrical commutator surface that runs true with its center. When you realize that this surface may slide under the brushes as fast as 120 miles an hour, you see why it must be as smooth and true as possible.

Remember that a commutator is not one solid piece. It is made up of many sections of copper and mica clamped between steel parts. All these materials react differently to temperature changes. This means that forces are set up which tend to shift the parts. Also, the parts tend to shift during operation because of centrifugal force. Now you can see why it is almost impossible to maintain a perfect commutator surface. In spite of all that can be done, small variations are usually present. Brushes, being forced against the surface by spring pressure, will follow these variations, *if they are not too sudden*. Beyond that point you start to get into trouble.

It is the maintainer's job to spot a surface that is heading for trouble and correct it before failure results. A knowledge of various surface conditions and how they affect commutation will be helpful. Let us examine the more common ones.

Eccentricity. — Although a commutator surface is smooth, it may be running off center, as shown in Fig. 3A. It is then said to be eccentric. This is one of the most

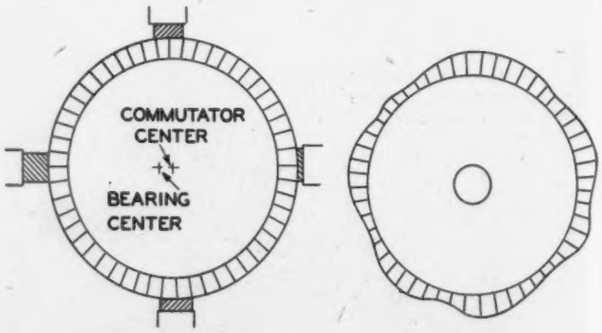


Fig. 3—Examples of commutator eccentricity and waviness, exaggerated for the purpose of illustration

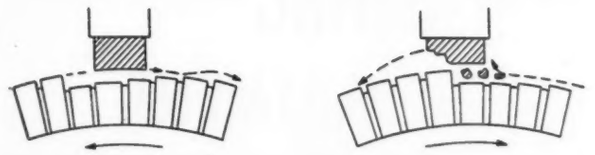


Fig. 4—Depressed bars may have different effects depending upon direction of rotation

common faults. It may result from the shaft being bent, the commutator being machined on bad shaft centers, or the bearings not running true. In single-bearing machines, such as generators, an offset coupling may be the cause.

This is usually the easiest of all surface variations for the brushes to follow. They simply rise and fall in the holders once with each revolution. However, as the speed goes up, this motion becomes faster. Finally, the brushes begin to break contact and gradually burn the commutator surface. As this continues the burning causes still further surface destruction.

Waviness. — The surface may develop waves, (see Fig. 3 B). To follow such a surface, the brushes must move in and out of the holders several times for each revolution. The motion is quicker for a given speed than that due to eccentricity. So, it is harder for the brushes to stay in contact with the surface. At high speeds, they bounce over the low spots like the tires of a car being driven rapidly over a rough road. Then we have sparking which burns the commutator surface and the brushes.

Surface Breaks. — Sometimes a sharp step or break occurs in a commutator surface, as shown in Fig. 4. It may be caused by a bump or blow to the commutator.

Fig. 6—Example of a soft commutator bar which has lifted at high speed

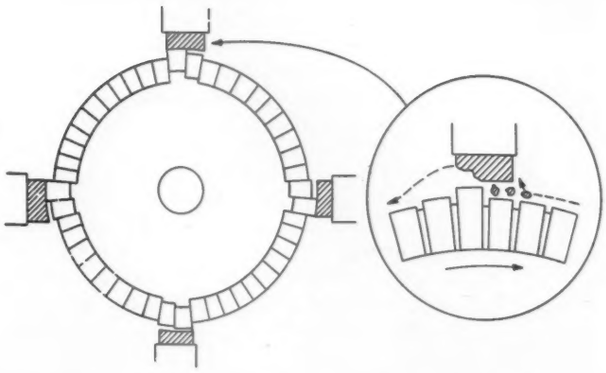


Fig. 5—Effect of high bars on brushes

The change in surface level may be very small, but it occurs almost instantly as the bad spot reaches the brush. For this reason, even a heavy spring load will not keep the brush in contact with the surface. If the commutator turns as shown in Fig 4A, the brushes will "ski-jump" from the high bar. Sometimes you can hear a distinct "click" as the brushes strike the commutator after their jump. If the rotation is as shown in Fig. 4B, the step strikes the brushes and "kicks" them away from the surface. At high speeds, this "kick" may be hard enough to shatter the brushes.

High Bars. — If a motor is held at standstill while the power is on, the commutator bars under the brushes will be overheated. These bars will expand and rise above the others. A commutator surface such as shown in Fig. 5 A is the result. The high bars kick the brushes and arcing and bouncing result, making the commutator surface even

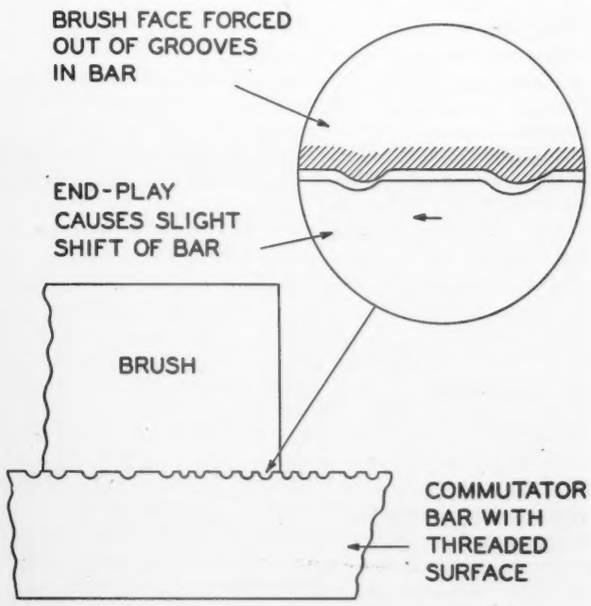


Fig. 7—Threading of the commutator as shown in the illustrations can cause the brushes to have reduced contact area when the commutator shifts due to end play

worse. If this condition is allowed to go uncorrected, the brushes will finally shatter and a flashover will result.

In severe cases, the temperature may get high enough to anneal the copper. The binder may even be burned out of the mica. This lessens the clamping action on the hot bars and they become loose. A commutator in this condition is very troublesome. The soft bars wear differently than the hard ones next to them. Because they are loose, they lift at high speed, as shown in Fig. 6.

If you suspect annealed bars, check them by comparing their hardness with that of adjacent bars. This can be done by the use of a sceleroscope or by some equivalent means. Often annealed bars can be spotted by their discoloration, especially at the ends where the brushes do not slide.

A quick check for loose bars can be made by tapping each one gently with a light hammer. At the same time, feel for vibration between bars with the finger tips.

Poor Surface.—The appearance of a commutator surface will vary. This may be the result of temperature, atmosphere, and the grade of brushes used. These all affect the thin film formed on the commutator surface during operation. A regular pattern of dark and light colored bars may develop. As long as the surface is smooth and polished, such changes in color are no cause for worry. When the surface becomes dull, raw and roughened by burning or abrasive action, trouble is on the way. Under some conditions, copper is pulled over the edges of the bars. This decreases the actual distance between bars. An arc formed at a brush is then more easily carried over to the adjacent set of brushes, resulting in a flashover. This is the commutator's warning that something is wrong. The wise thing is to find the cause of the trouble, and do all you can to correct it.

Looseness.—Glancing back, Fig. 1 shows how a commutator is held together by the clamping action of the shell and cone. Failure of the clamping action may be caused by loose or broken commutator bolts. It pays to check these bolts regularly. If even one fails or works loose, it can cause a serious accident. Overheating of the commutator is another source of looseness. This may be caused by lack of ventilating air, overload on the machine, or sparking. The heat may soften the mica binder. Then the flakes of mica shift away from the pressure areas, and the bars loosen.

Threading.—This is the most common surface defect running around the commutator, crosswise to the bars. It shows as small, thin grooves cut into the surface by abrasive action. The brush face wears to fit into these grooves. When the commutator shifts, due to end play, the brush is lifted out of these grooves, as shown in Fig. 7. The contact between the brush and the commutator surface is disturbed and poor operation may result.

Any of these commutator defects acts like a break in a highway pavement. At first, it is hardly noticeable, but if it is not cared for, it becomes worse and worse, until finally the road must be closed. So, a commutator does not fail suddenly. It gives warning in time for the trouble to be corrected. Bouncing, or shattered brushes, or bad overloads, will cause arcing at the contact surface. When these arcs become severe enough, they will bridge the insulation between bars. This permits the power to spill over between brushes in a burst of flame hot enough to melt metal. This is the commutator's final protest against abuse. Evidence that a machine has flashed over is found in copper splatterings on the surface and ends of the commutator bars. Often these are also found on the brush holders, the surrounding insulation, and nearby parts of the steel frame.

CONSULTING DEPARTMENT

Diesel-Electric Locomotive Batteries

Questions and Answers

Q.—Why does a battery have to be kept clean?

A.—To prevent external circuits across the top of the battery and retard corrosion.

Q.—How often should a battery be washed?

A.—A battery should be washed every month at the time of inspection of the entire diesel.

Q.—Should battery be washed with soda if a cover is cracked or cell leaks?

A.—Cracked or leaking cells should be repaired before the battery is cleaned.

Q.—Can battery be cleaned with high pressure air?

A.—Yes. Provided the battery has been washed with a neutralizing agent before. It is recommended that the tops of the batteries be washed with a solution of soda and water and then blown dry with a steam or air hose. Either hot water or steam can be used to clean a battery.

Q.—How often should a battery compartment be cleaned and painted?

A.—It is recommended that the battery compartment be cleaned and painted at the time of the annual inspection of the locomotive.

Q.—What kind of grease on termilals won't wash off?

A.—No-Korode.

Q.—What happens when there is a loose connection?

A.—A high resistance contact results, and if an arc develops, it is possible for the entire terminal to burn off.

Q.—How often should the battery compartments be checked for tightness?

A.—At least every thirty days.

Q.—What causes corrosion on the positive terminals and connectors?

A.—Corrosion of the positive terminals and connectors is more noticeable than the negatives, in that the positive terminal becomes peroxidized through the action of the charge to the battery.

Q.—What causes burning or melting at terminal connections?

A.—A loose connection,—poor contact.

Q.—How can you detect a shorted cell?

A.—Low specific gravity and low voltage is an indication of a shorted cell.

Q.—Is it always necessary to take voltage readings when taking gravity readings?

A.—It is not always necessary, but it is a good idea to give you a complete picture of the condition of the battery. If all cells have equal specific gravity readings, it is safe to assume that the voltage will read likewise.

Q.—Is it necessary to take the temperature of each cell?

A.—It is recommended that the temperature of every fifth cell be taken.

Q.—In equalizing a battery, how can you tell when battery is completely charged?

A.—When the specific gravity of a battery stops rising and remains constant for three one-hour readings, it is safe to assume that the battery is fully charged.

Q.—What strength acid should be added?

A.—Normally, acid should never be added to a battery unless with the advice of a competent battery man.

When batteries leave the shop they are clean and connections are tight. They must be kept that way to insure their giving the service that is expected of them

Q.—Why is it that gravity reads higher (after equalizing) when it has been in service for a month or so?

A.—If the battery reads higher, for instance, (after equalizing) when it has been in service for a month or so, it is an indication that the battery may not have been in a fully charged condition when the first reading was taken.

Q.—Does battery temperature have anything to do with adding acid? The question usually is, should equalizing and charging be stopped at any definite temperature?

A.—Equalizing and charging of batteries should be stopped when the temperature rises to 115 deg. F. and the battery allowed to cool before continuing the charge. The temperature of the battery doesn't have anything to do with adding of acid, except the proper temperature correction of the gravity should be made as indicated previously.

Q.—If no cells are leaking, why should battery be equalized?

A.—A storage battery being charged through voltage regulations such as diesel battery, may never need to be equalized.

Q.—Is it safe practice to cut cells out?

A.—Sometimes it is better to cut cells out of circuit if it is impossible to repair the cells at once. This is an emergency measure only. Whenever cells are cut out of the circuit, the voltage regulation must be adjusted for this reduction in cells.

K. A. VAUGHAN
Gould Storage Battery Corporation

Authenticated News Photos

British double-deck electric train, shown on a run between London and Dartford, England, consists of four cars, and has a seating capacity of 552 persons

EDITORIALS

What Makes A Successful Convention

The meetings of the five Coordinated Mechanical Associations and the A.A.R. Electrical Sections, held at Chicago September 17 to 19 are now history and it is worth while to record the fact that this year's convention was a success from the standpoint of both the railroad and the supply industry. Many factors made this possible. Three of these are worthy of emphasis. First is the character of the organizations themselves, determined by their purpose, the soundness of their organization plan and by the effectiveness with which their programs measure up to their objectives. Then there is the matter of the geographical location and the general character of the meeting place. A third factor is the associated exhibit of appliances and materials when one is held, as it was at the Hotel Sherman this year.

There can be little doubt that the associations referred to here, since they have been working together under their own coordinating committee with the guidance and support of the A.A.R. Mechanical Division, have developed characters which contribute definitely to their growing influence. The present numerical strength of the various organizations varies but there is little evidence that any of them is losing ground, even the Master Boiler Makers', which is resolutely facing the toughest problem of them all because of the declining importance of the steam locomotive. Several are steadily increasing their membership. Their programs are constructively dealing with problems which are currently acute and the organizations are being effectively operated.

Over the years there have been numerous ideas as to the character of meeting places desirable for associations of railway men. Some of the smaller organizations formerly liked to get around, holding each annual meeting in a different city. This policy favored various sections of the country in successive years and, for small, cohesive organizations, worked reasonably well. Another idea long in vogue is to meet at a resort where the vacation atmosphere is dominant, particularly when an exhibit is involved. This has lost much of its popularity with the railroads largely because of the excessively elaborate entertaining which it inspired. Now Chicago has become well established as a central location where meetings, with or without exhibits, can be held in an atmosphere congenial to serious business and with little time allowed for extraneous activity. This tends to keep entertaining within reasonable bounds. From casual observation of the sessions it seems evident that entertainment is not interferring with the attendance.

That these characteristics of Chicago meetings do not militate against their success seems to be definitely proved by the way in which the attendance at the full Mechanical conventions has been growing during the past few years. Registration at this year's Coordinated Association meetings, including that of the electrical Sections, amounted to over 4,500, of which 2,500 were members or railroad guests of the railroad associations, 1,320 were railway supply men and the remainder ladies. Allowing for an overlap of between 10 and 15 per cent of the railroad-association registration for the supply men who also registered as members of these organizations, the railroad attendance at these meetings this year was record-breaking.

An outstanding exhibit, such as that organized by the Allied Railway Supply Association at the Hotel Sherman this year, will be a stimulant to the attendance of railway men at future conventions; the character and extent of the exhibit, in turn, was undoubtedly influenced by the excellence of the attendance at previous annual meetings of these associations.

The 110 exhibitors filled all the space available. Comments from exhibitors indicate that it generally commanded the interest of the railroad men. Those who attend these meetings are the ones who are generally directly concerned with the operation and maintenance of a large proportion of the devices exhibited, a fact which goes far to account for the mutual satisfaction of both parties with these meetings and exhibits.

Location is a matter of equal importance to the railroad associations and to the exhibitors. The growing success of these fall mechanical association meetings and exhibits over the past several years suggests that a central location, dominated by an atmosphere of business, is right for the associations and the exhibitors alike.

How Can Diesel Clubs Be Most Useful

Diesel clubs have increased in numbers and have grown in membership to the point where they can be of substantial value to mechanical departments in improving the operation of diesel power and reducing the costs. Their importance has grown to the extent that their overall policies both individually and collectively can have a direct bearing on the education of mechanical-department employees. What then should be the function of diesel clubs best to serve the railroad industry and its employees?

Should the general aim of a diesel club be to disseminate knowledge to its members so that all will have a passable ability to maintain locomotives; or, should the primary purpose be to distribute more advanced knowledge to those hoping to approach the expert level? Should the programs in the main be devoted to schoolroom education on how the equipment is put together and why it operates as it does; or should the meetings be primarily forums for discussion of problems as they arise, assuming that basic principles and design are well understood? Again, on the degree of advancement of the subject matter, should equipment descriptions be devoted to the fundamentals for those who are unable to understand these fundamentals from reading the manuals; or should the meetings be devoted to extension of the information contained in the instruction manuals, telling not only what the equipment is like and how it operates, but go into the "whys" of the design and the troubles that occur as well?

Can diesel clubs compromise their programs to widely divergent groups so that subjects at meetings will neither be over the heads of the beginner nor too elementary for the experienced? Or would an attempt at such a compromise lead to all members losing interest, the beginners because they were hopelessly confused and the more experienced because the program seemed to them like a kindergarten?

What about division between crafts of the maintenance forces, and between those concerned with maintenance and with other aspects such as operation? Should there be separate meetings or clubs for major divisions? It is pretty well established that the machinist and the electrician should know something of each other's problems and difficulties because of the close relationship between the mechanical and the electrical parts of the locomotive. But just how far should this go? It must necessarily be accomplished at the expense of a man learning less about his own craft. There are workers whose job requires little if any knowledge of other types of work; a sheet-metal worker handling steam generators has little reason to know anything about air brakes, for example.

It is likewise important to decide whether the railroads should first decide what type of personnel training they want and have the diesel clubs help provide this training or whether the diesel clubs should go on educating the railroad employees in whatever way they think best and then have the railroads adapt their organizations to the type of training that the diesel clubs have helped to give them. The railroads should decide whether they want a diesel maintenance organization in which everybody knows a little and can stumble through most any job that comes up, given sufficient time to work it out, or whether it would be better to have a few experts on each of the major components of the locomotives who would direct the mechanics as to what to do to a part that is giving trouble, e.g., clean it, change it, repair it, etc.

These are matters which should not be decided without having been given serious consideration. They may involve matters of railroad policy but an informal discussion may clear the points.

Electricians For the Diesel Shop

Six years ago, a diesel shop foreman of a southern road said, "The time is not so far distant when we will need as many electricians in the diesel shops as we will mechanics." It would scarcely seem that this would ever quite come to pass, but the need for more electrically trained men has become a problem for many roads.

Only a few days ago, the shop superintendent of an eastern road asked, "Do other roads have as much trouble as we do finding electricians?" Had shop superintendents of the "other roads" heard that question, they would have answered that not only do they have trouble finding good electricians, but in the face of competition from defense industries, they have difficulty in keeping those they have.

One of the difficulties arises from the fact that a "good" diesel electrician really should be a good mechanic before he takes on the responsibility for things electrical. It is no longer easy to distinguish the difference between electrical and mechanical work in the diesel shop. Many mechanical devises are in part electrical, and the maintenance of many electrical devices (commutators being one example), requires the best of mechanical precision.

Many men with a background of railroad experience—men who feel their business is railroading—have found their jobs in jeopardy or their future uncertain because of the decline of the steam locomotive. It is from among these men that those to fill most of the new jobs must be found.

It is in recognition of this situation that *Railway Mechanical and Electrical Engineer* is running the series of articles called "Diesel-Electrics—How to Keep 'Em Rolling." The articles began in the July, 1951, issue, and will continue for at least a year and a half. They deal specifically with electrical equipment used on diesel locomotives. They are written so that an electrical background is not necessary for their understanding. Although they deal with technical subjects, they make interesting reading. Each article is complete in itself, but for those who were not subscribers in July, reprints of the first articles will be made available. We believe the uninformed reader will find that many electrical mysteries are pretty simple things, and that those with long experience will discover things they have forgotten. All will learn specific requirements of diesel equipment.

NEW DEVICES

Dynamic Grill for Diesel Locomotive

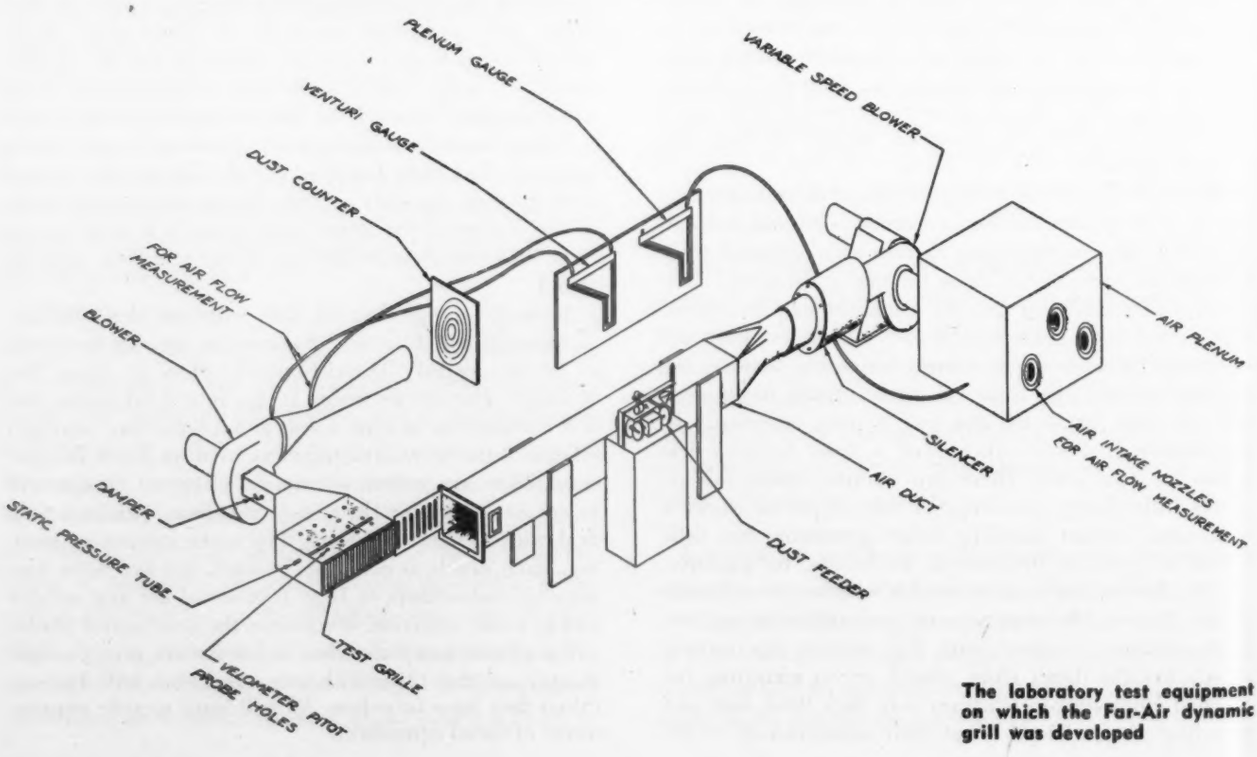
During heavy snowstorms snow has come through the engine-room air filters of diesel locomotives and has shorted electrical apparatus to such extent as to cause unit failures. This is not surprising, for it cannot be expected that filters 2 in. thick can catch and hold the load of snow accumulating during a 4- to 6-in. snowfall. Such rapid loading on the face of the filter would clog it and then the demand of the engine for air would be so great that snow would actually be pulled through the filters.

In 1947 a railroad presented to the Farr Company. Los Angeles, Cal., the problem of how to keep snow out of diesel locomotive engine rooms. It was at first felt that some kind of installation could be made inside the filters to seal off and prevent snow from entering the engine room. However, such an installation, under certain conditions, would shut off the air supply to the engine and the lack of cooling air could also interfere with traction-motor operation.

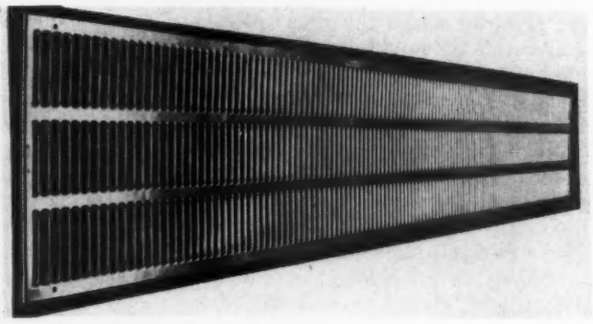
A laboratory project was next scheduled to develop some kind of baffling device which could be placed on the outside and which would prevent snow from reaching the filters. It was recognized that any such baffling device, if placed on the outside of locomotives, would need to function in both directions of locomotives travel and that restriction to air flow be low enough not to interfere with engine performance, radiator performance, or dynamic grid performance. It was also felt to be highly desirable that such a piece of equipment, which would be mounted on the outside of the locomotive, should have some decorative appeal.

With these requirements in mind, laboratory testing was carried on with the purpose of developing some device which would keep snow out of diesel locomotives. In laboratory procedure, with the grill model fixed and stationary, air was blown through a duct and on out over the intake face of the model grill and air was drawn through the model at right angles to the direction of the air stream across the face of the grill at the velocity required in road operation. The air velocity past the model intake face was variable from zero to approximately 125 m.p.h. The test setup is shown in one of the illustrations.

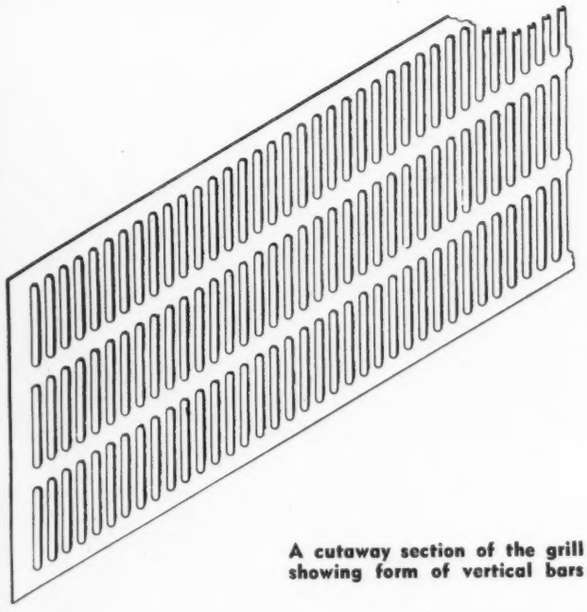
Nothing closely resembling snow was available for testing material. Because of its light density corn-meal dust was used for this purpose. The —40 +50 mesh-sieve fraction was the size range used for testing. Railroad personnel familiar with the snow nuisance said that, in size and gross appearance, it closely resembled snow when wind-driven at low temperatures. It was felt that this kind of snow would be the most difficult to keep



The laboratory test equipment on which the Far-Air dynamic grill was developed



A section of the Far-Air dynamic grill approximately 12 ft. long by 2 ft. wide



A cutaway section of the grill showing form of vertical bars

from entering the locomotive body. The corn-meal dust was introduced with a dust feeder by means of compressed air and at a uniform rate.

Grill performance was evaluated by comparison with existing locomotive air intake design and also with an open space of the same size having no protective covering. Quantitative particle baffling efficiency was determined by blowing all the air which was drawn through the open space or model grill through a venturi section sized to impinge all the entrained particles on a flat adhesive-coated target with concentric circles for easy counting. Efficiencies were determined by the number of particles found to have been drawn through the different test grills as compared with the number drawn through the open space of the same area.

Some 50 to 75 different models were tested before settling on a single design. The selected design showed that approximately 95 per cent of the corn-meal dust was baffled off, as compared with the open space, when air velocity past the face of the model grill was in excess of 2,000 f.p.m. Incidentally, these test results have been confirmed by another laboratory setup.

A cutaway section of the grill is illustrated. It is installed so that the half-round bars are even with the outside surface of the side walls of the locomotive and the bars are in vertical alinement.

The operation of the grill is simple. The air flowing past the grill, because of the speed of the locomotive, is forced to change direction to enter the grill. The net velocity through the grill openings in front of the filters at full air requirements is approximately 1,000 f.p.m. Particles such as snow, which are in the outside air stream which is flowing at right angles to the grill face, are forced to make a 90-deg. bend in order to enter the grill. The mass of these particles is such that, when the train has any speed at all, the particles do not turn as sharply as the air stream with the result that they impinge on the round surfaces of the grill bars and are baffled out again into the outside air stream. This effect is similar to the operation principle of a dynamic separator, hence the name "Dynamic Grille."

The grill has no functional value while the locomotive is standing or running at very low speeds. It was found, however, that the troubles caused by snow were encountered usually when the locomotive was traveling on the road. Likewise, the grill is non-functional, dynamically, when the train is traveling through a side wind.

After the laboratory testing, the next step was to install a full-scale grill on a locomotive for testing on the road. This was done in 1948 and extensive field testing was begun. The first quantitative road tests made were in the summer. With these tests efficiency was evaluated on the basis of the amount of dirt the grill kept from reaching the air filters. The grill was actually applied to a booster unit in a four-unit 6,000-hp. locomotive.

Quantitative tests were made on this locomotive while in passenger service between Chicago and Los Angeles. Determination of effective grill efficiency was based on comparison of the weight gain of the filter in the booster unit behind the dynamic grill with the weight gain of the filter behind the standard protection for diesel locomotives on the adjoining booster unit. Several tests were made and they indicated that the dynamic grill baffled off somewhere between 50 per cent to 75 per cent of the dirt encountered in operation. The train operated in both directions so that each unit operated half the time in the No. 2 position and half the time in the No. 3 position. The variance in efficiency results was attributed to the probability that variable dust conditions were encountered during the test periods. The heavier the dust concentration and the larger the particle size, the more efficient the grill would be.

The objective of this project was specifically to prevent snow from getting into diesel locomotives. However, after developing the grill, it was found that it also reduced the amount of dirt which the filters had to handle, which consequently reduced the amount of dirt which actually entered the engine room. This dirt baffling feature of the grill is highly beneficial, especially in sandstorms or localities where high concentrations of dust, which would ordinarily swamp the filters and temporarily lower their efficiency, are encountered. Since the grill is more efficient on large particles due to their greater mass, it does an excellent job of keeping large particles, such as cinders, from even reaching the filters. The grill is not too efficient on very fine particles due to the fact that at velocities comparable to speeds that are normal to locomotive operation, the inertia of the very small particles is not great enough to cause them to be separated from the air stream entering the grill.

When a snowstorm was encountered, the booster unit which had the dynamic grill was in the No. 3 position. The outside temperature was in the range of zero to 10 deg. F. and the train was traveling between 40 and 55 m.p.h. In this test it was observed that in the No. 2 unit,

considerable snow was on the car-body filters and snow actually entered the locomotive body. In the No. 3 unit, which was equipped with the dynamic grill, there was no snow whatever in the car body, and only a small amount was showing on the car-body filters. In the trailing unit No. 4, snow was packed in the car-body filters and was coming through them in amount large enough to pack in the engine air filters and to cover the floor of the engine room. During this test run, when a filter was removed from the panel, scarcely any snow came through the grill and it was observed that there appeared to be a heavy layer of snow in the air outside staying about 2 to 3 in. away from the face of the grill. This denser layer of snow, no doubt, consisted of snow particles which had been baffled off by impingement on the curved surfaces.

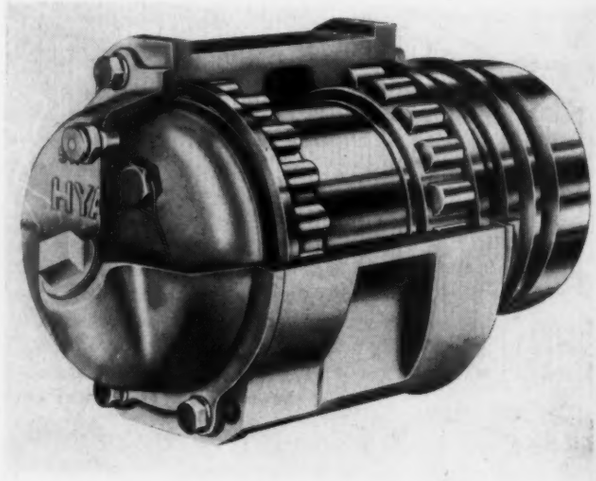
Special checks were made with the locomotive both stationary and in operation to prove that the grill did not starve the radiators or dynamic grids of air flow. If the grill did starve either one of these important air requirements it would have been impracticable in field operation. Strangely enough, laboratory tests indicated that the higher the train speed, the lower the resistance to air flow through the grill. The resistance to air flow through the grill at required entering velocities is in the order of 0.15 in. of water.

The grill does not assure protection against snow and dirt under certain conditions, but is believed to operate efficiently during enough of the locomotive operative time to make it worth while to apply to diesel locomotives, particularly where ornate grills of no functional value are put on merely for decorative trim, and especially since the dynamic grill can be applied at approximately the same cost to the railroads.

A considerable number of the Far-Air Dynamic Grilles are in operation on diesel locomotives with reports of excellent performance.

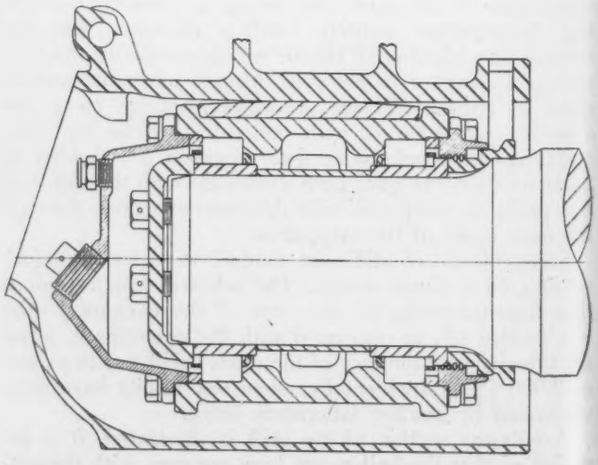
Hyatt Roller Bearings For Freight-Cars

A new line of roller-bearing journal boxes for freight cars has been developed by the Hyatt Bearings Division of General Motors Corporation, Harrison, N. J., which are designed to fit conventional freight-car trucks with both the integral box type and pedestal type side frames. They can be installed to replace existing plain-bearing equipment with minimum alterations to the truck side frames.



Hyatt freight car bearing assembly

Hyatt freight-car journal bearing installed in the journal box of an integrally cast side frame



Sectional view of the Hyatt freight-car bearing unit assembled in the plain-bearing journal box

The Hyatt freight-car journal boxes are grease lubricated. The bearings are of the straight radial type which are said to give maximum load-carrying capacity in the space provided. Thrust loads are taken against liberally proportioned race flanges. The radial construction of the bearings permits car axles to float laterally within predetermined limits, reducing sidewise shocks and wheel flange wear.

All bearing and box parts are accessible for cleaning and inspection. Both the journal boxes and the bearings can be removed from the car axles without breaking the race fits. Spare wheel and axle sets may be stored with the inner races, spaced and thrust rings in place, but without complete journal boxes, thus reducing spare parts inventories.

The Hyatt housings for integral box type side frames are designed so that they can be reversed top to bottom to present a new wearing surface in the bearing load zone. This increases the usable life of the unit.

How the bearings are assembled on the axle and inserted in the journal box is shown in the sectional view of the bearing unit in the journal box of an integrally cast freight-car truck side frame. The same procedure as to maintenance which has been developed on Hyatt journal boxes on diesel locomotives and passenger cars applies to the new line of freight-car bearings.

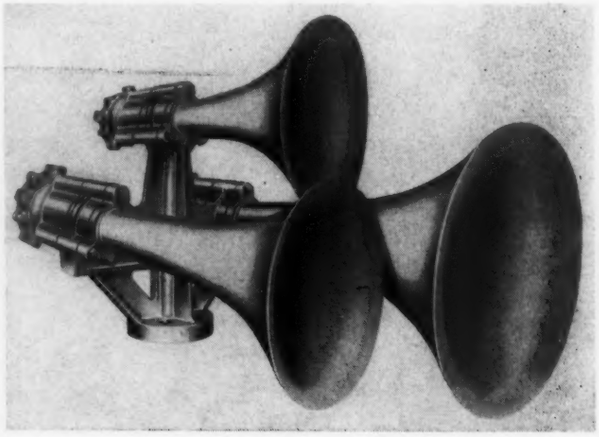
Leslie-Supertyfon Locomotive Horn

The chime type of air horn is a more pleasing sounding device than its brother, the single-tone air horn. Musical chords, considerations of overtones and fundamentals were the chief concern of the Leslie Co., Lyndhurst, N. J., in getting its Chime-Tone air horn to sound like the steam chime. The result is a multiple horn device ranging from two to five units, depending upon the chord and power desired.

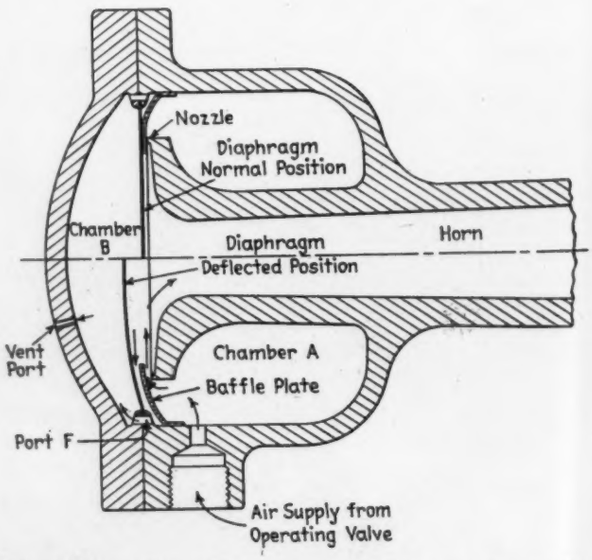
After working several years in developing tone, air consumption, power output and dependability of horns of this type the engineers of the Leslie Co. began a new series of investigations and finally have settled upon a new principle incorporated in an invention of Gustav Broden, development engineer of Kockums Mokaniska Verkstad Aktiebolag, Malmo, Sweden. Negotiations which involved conferences between the engineering departments of both companies culminated in a manufacturing agreement. The new horn is now known in the United States and Canada as Leslie-Supertyfon.

Generally, when high sound outputs are generated by a vibrating diaphragm, high stresses are experienced within the diaphragm and the constant flexing and reversal of the stresses causes the diaphragm to fail from fatigue. In the power chamber of the Leslie-Supertyfon a unique valving arrangement formed by the diaphragm itself as it vibrates permits the use of the operating air to move the diaphragm in both directions. As a result, it is possible to use a much lighter diaphragm of more flexible character than would normally be employed in such a device. The principle of operation is as follows: When the air-horn operating valve is opened to blow the horn, high-pressure air is admitted through a port to chamber *A*, building up the pressure in *A*. This pressure exerts a force on the diaphragm through the flexible baffle plate, tending to force it away from the nozzle and, at the same time, away from the baffle plate. As soon as the diaphragm moves away from the nozzle and baffle plate, air is permitted to escape past the diaphragm into the horn and at the same time through port *F* to the back of the diaphragm (chamber *B*). The build-up in pressure in chamber *B* exerts a force on the diaphragm, resisting further travel, and, by virtue of the greater effective diaphragm area exposed to chamber *B* as compared to chamber *A*, tends to restore it to its original position.

At the same time as the air pressure is being fed into chamber *B* and out through the horn the pressure in chamber *A* tends to fall, which also reduces the tendency



A three-tone Leslie-Supertyfon chime horn



Schematic section of the power chamber of the Leslie-Supertyfon horn

for the diaphragm to travel away from the nozzle and allows the pressure in chamber *B* to exert its restoring force. Pressure in chamber *B* also leaks off through the vent port in the cover to the atmosphere so that when the diaphragm has returned to its normal position against the nozzle and against the baffle plate, cutting off the supply to chamber *B*, the pressure will fall and the press-

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oil R.R.

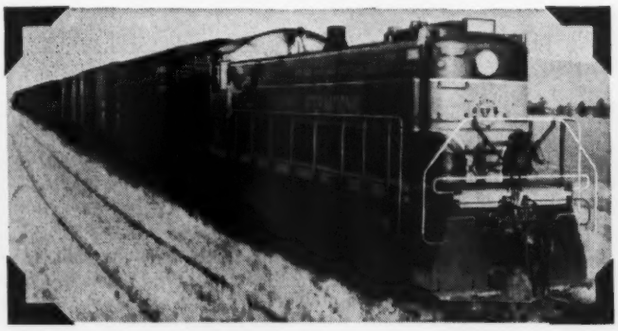
UNIT Alco Diesel – 6 cyl. 12½" × 13" – 1000 H.P.

SERVICE Mountain haul – Heavy snow, extreme cold

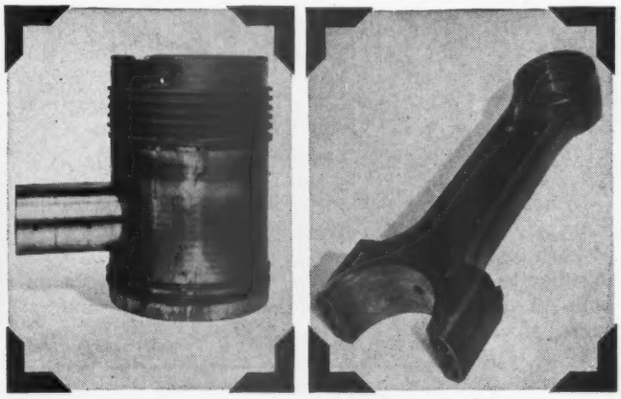
LOCATION Spokane, Wash. – Yahk, B.C.

FIRM Spokane International R.R. Co.

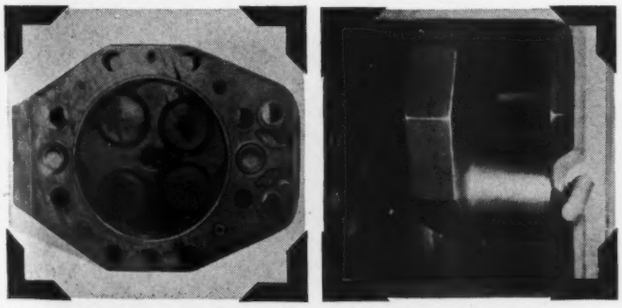
Engines in "perfect condition" after year of toughest service!



LUBRICATED WITH RPM DELO Oil R.R., nine new diesels owned by the Spokane International R.R. Company were kept in regular service for one year. The winter was exceptionally severe and the locomotives bucked heavy snow almost daily. They worked or were idled in temperatures that often for periods of ten days averaged from 20 to 40 degrees below zero.



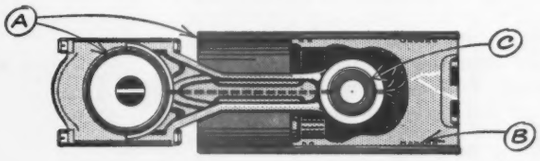
On inspection at the end of that time there were no accumulations of sludge in oil systems and the engines were in "perfect condition" as pictures of parts from one of them indicate.



NO CARBON had collected on the cylinder head and all rings were free and functioning properly. Connecting-rod and main bearings and wristpin were within standard tolerance. Measurement of the liner showed less than 0.001 inch wear.

REMARKS: The Spokane International Railroad provides an important connecting service between transcontinental lines through Spokane and the Canadian Pacific to the north. Most of their trackage is in northern Idaho where severe weather and other conditions often make operation difficult. RPM DELO Oil R.R. will meet the toughest weather or operational conditions in all locomotive diesel engines.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean... helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of bushing or bearing metals and foaming in crankcase.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

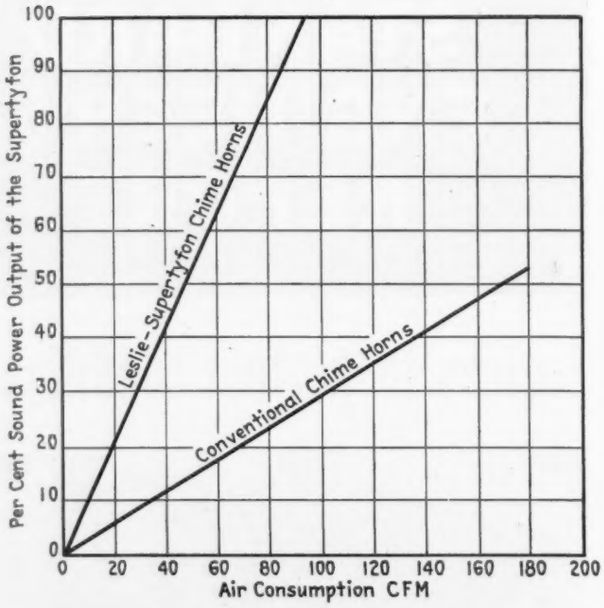
ure in chamber *A* will again rise to the point where the diaphragm can be deflected and the cycle repeated.

It is this patented valve action that keeps the diaphragm deflection and stress low and permits the use of a very thin flexible member which always operates at stresses well within its proportional limit and, as a consequence, gives long diaphragm life.

The use of the air in this new principle is extremely efficient and is best realized by referring to the graph of conventional air horns versus the Leslie-Supertyfon for power output versus air consumption. This records the results of comparative tests. The sound power output, which was measured in decibels, is plotted in per cent of the maximum output of the Supertyfon. It will be seen, for instance, that an output of 50 per cent of the new horn's capacity is produced with an air consumption of about 48 c.f.m., whereas the same sound output from a conventional horn requires an air consumption of 170 c.f.m., and that the full output of the new horn is produced with an air consumption of about 95 c.f.m.

There are no adjustments to be made or go out of order as the Leslie-Supertyfon is entirely self adjusting. Extensive tests in the United States and several years' service in Europe have verified the advantages of this type of horn.

In addition to the patented power chamber, the Leslie-Supertyfon incorporates a true musical instrument design of horn or bell and produces tones which, when sounded together as a musical chord, are said to be close to the tones of the old steam whistle which was built like an organ pipe.

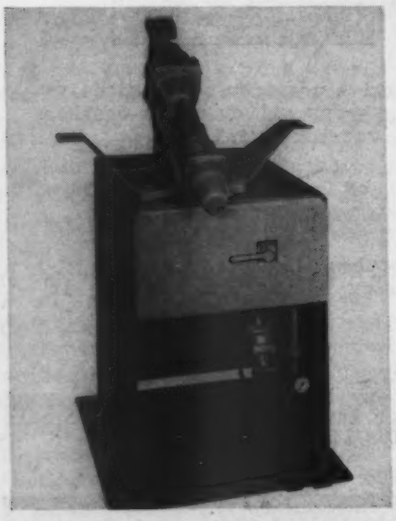


A comparison of sound power output in relation to air consumption of chime horns

The Leslie-Supertyfon chime horn is available in a choice of chords to simulate different tyes of locomotive steam whistles and can also be used as a single-tone when desired.

Westinghouse Machine Applies Punch-Lok Clamps

A hose-clamping machine for applying Punch-Lok clamps to air-brake hose is now being marketed by the Westinghouse Air Brake Company, Wilmerding, Pa., after being under development for several years. This company has adopted these clamps as its standard for air-brake and signal hose. Designed to apply the clamps with uniform tension, this machine practically eliminates all of the manual effort formerly involved in clamp application.



The Westinghouse B-1 hose-clamping machine for applying Punch-Lok clamps

The machine is pneumatically operated and only three seconds are required to complete the clamping application cycle. The operator places the hose in the machine and presses the pedal. The whole sequence—clamp tightening, punch locking, and shearing of the clamp tail—occurs automatically. Preliminary studies of machines installed in railroad shops suggest that a single machine may be effectively used to consolidate several former stages when applying the bolt-and-nut clamps. The Punch-Lok clamps are packaged one thousand to a carton and are available for prompt shipment.

Motorized Cutting Torch Holder

Remote control raising and lowering of cutting torches of the Airco Oxygraph or Travograph type through 5 in. of travel has been made possible with the introduction of a motorized torch holder by the Air Reduction Sales Co., Division Air Reduction Co., Inc., New York 17.

The remote control switch box mounted on the 3 in. square torch bar of the Oxygraph or Travograph devices at the operator's control station, provides a switch

(*Continued on p. 122*)

KOPPERS K-Spun POROUS CHROME RINGS double mileage of railroad diesels . . . cut cylinder wear in half . . . slash maintenance costs

Koppers K-Spun Piston Rings, produced by centrifugal casting process, are *100% stronger . . . four times more resistant to combustion shock than ordinary rings! They will not break in installation or for the life of the engine.*

Koppers Porous Chrome* Rings have a porous chrome surface that holds and distributes oil during break-in, quickly wears down to perfectly seated solid chrome that prevents grit and other particles from embedding in the ring surface where they can scratch cylinder walls. Porous Chrome Rings last up to four times as long as other rings, reduce cylinder wear 50% or more.

That's why railroads everywhere are reporting amazing savings in equipment and maintenance costs through the use of Koppers Rings. Remember . . . we make rings for any equipment that uses piston rings.

*VAN DER HORST PROCESS

If you have a piston ring problem, why not get the *right* answer from us? Write, wire or phone Koppers Co., Inc., Piston Ring Dept., 1670 Hamburg St., Baltimore 3, Md.

KOPPERS

KOPPERS

AMERICAN HAMMERED

PISTON RINGS

SPECIFY: Fast's Couplings . . . Koppers Piston Rings . . . both famous products of the Koppers Co., Inc.

ONLY KOPPERS CAN FURNISH K-SPUN OR POROUS CHROME!

NEWS

Old Cast-Iron Car Wheels Will Help Make New Ones

CAST-IRON car wheels which are scrapped each year—amounting to about 550,000 tons—will henceforth be used only in the production of new cast-iron wheels, according to a recent order issued by the National Production Authority.

About 130,000 cast-iron car wheels are needed each month for maintenance and repair, N.P.A. announced. It said this means a monthly requirement of about 46,000 tons of cast-iron to keep freight cars in repair.

The new order provides that no person shall deliver or accept delivery of more than 10 tons of used cast-iron car wheels in any one month, except as authorized by N.P.A. Producers of new cast-iron wheels must certify in purchasing used wheels that the metal will go into the production of new freight car wheels.

Locomotive Builders Advisory Committee

THE National Production Authority, U. S. Department of Commerce, has announced the membership list of the Locomotive Builders Industry Advisory Committee as follows: W. S. Morris, vice-president, American Locomotive Company; R. N. Watt, vice-president, Baldwin-Lima-Hamilton Corporation; J. Horky, manager, Brookville Locomotive Works; George W. Koch, vice-president, Davenport Besler Corporation; V. H. Peterson, vice-president, Fairbanks, Morse & Company; G. W. Wilson, manager locomotive, and car equipment department, General Electric Company; B. A. Dollens, vice-president, Electro-Motive Division, General Motors Corporation; C. E. Pond, assistant to supt. motive power, Norfolk & Western; Roy J. Johnson, sales manager, Plymouth Locomotive Works; Joe E. O'Brien, sales manager, Vulcan Iron Works, and Chas. Olson, general manager, Whitcomb Locomotive Company.

B. & O. Turns Out Last Steam Locomotive

THE last steam locomotive to be repaired in the Glenwood maintenance shop of the Baltimore & Ohio near Pittsburgh, Pa., rolled out of the shop on August 31. Only diesel-electric locomotives are now maintained at this shop where the B. & O. has already spent nearly $900,000 of an allocation of more than a million dollars for the installation of new diesel facilities. Plans have also been made for the expansion of these facilities to take care of the constantly increasing number of diesel-electrics acquired by the road.

The last steam engine to be repaired was No. 1065, an eight-wheel switch locomo-

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE SEPTEMBER ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horse-power*	*Service*	*Builder*
Boston & Maine	11[1]	1,600	Road-Switch	Alco-G. E.
	12	660	Switch	Alco-G. E.
	7	1,200	Switch	Electro-Motive
	9	1,500	Road-switch	Electro-Motive
Atlanta & St. Andrews Bay	2[2]	1,500		Electro-Motive
Missouri-Kansas-Texas	20[3]	1,200	Switch	Electro-Motive Baldwin-Lima-Hamilton
Seaboard Air Line	15[4]	1,500	Freight	Electro-Motive
	10	1,600	Passenger	Electro-Motive
Toledo, Peoria & Western	2[5]	1,500	Road-switch	Electro-Motive

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Burlington Refrigerator Express Co.	100	500-ton refrigerator	Pacific Car & Fdry.
Denver & Rio Grande Western	25[6]	70-ton covered hopper	Pullman-Standard
Detroit, Toledo & Ironton	100[7]	70-ton covered hopper	American Car & Fdry.
Grand Trunk Western	350[8]	50-ton box	American Car & Fdry.
	250	70-ton triple hopper	American Car & Fdry.
Gulf, Mobile & Ohio	250[9]	95-ton hopper	Pullman-Standard
Macon, Dublin & Savannah	2[10]	Cabooses	International Ry. Car & Equip. Mfg. Co.
Seaboard Air Line	400[4]	70-ton cement	Pullman-Standard
	600	50-ton gondola	Pullman-Standard
Tennessee Central	200[11]	50-ton hopper	Pullman-Standard
Texas & Pacific	25[12]	Cabooses	Company shops
Western Fruit Express Co.	300	Refrigerator	Pacific Car & Fdry.

FREIGHT-CAR INQUIRIES

Bessemer & Lake Erie	500	70-ton ore
Norfolk & Western	1,000	70-ton gondola
Western Pacific	300	70-ton gondola
	100	50-ton dump hopper
Virginian	1,000	50-ton hopper

[1] For delivery next year.
[2] Deliveries expected to begin next January.
[3] Number of units to be ordered from each builder not announced. To cost approximately $2,050,000. Delivery expected in February.
[4] Delivery of the motive power scheduled for December and January. Delivery of the freight cars scheduled for September and October, 1952.
[5] Estimated cost of each, $148,000.
[6] To cost approximately $182,500. Delivery expected during the third quarter of 1952.
[7] Delivery scheduled for the third quarter of 1952.
[8] The cost of the box cars is estimated at $2,257,000; the hopper cars, $1,528,000. Delivery expected during the late summer of 1952.
[9] The cost of the hopper cars is estimated at $2,400,000. Delivery is scheduled for late 1952 or early 1953.
[10] Estimated cost, $23,200. Delivery expected during the last quarter of this year.
[11] Approximate cost, $980,000. Delivery scheduled for the summer of 1952.
[12] To be built sometime during 1952, actual construction date depending on availability of necessary materials.

NOTES:

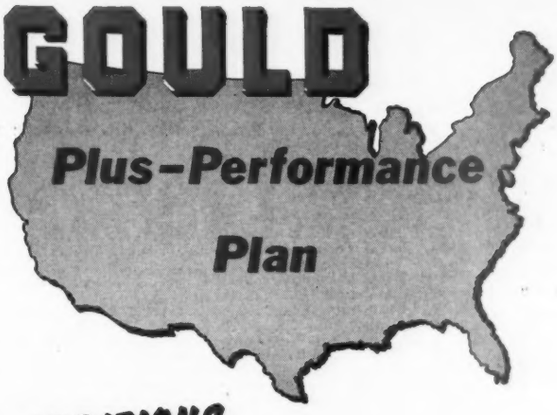
Erie.—The board of directors of the Erie has authorized the purchase of 13 additional diesel-electric locomotive units costing an estimated $1,900,000. According to Paul W. Johnson, president, when delivery is made of 15 units recently ordered, and the 13 just authorized, the Erie "will be within striking distance of its goal of complete dieselization." Steam locomotives are now in use on only three of the road's divisions.

Long Island.—The Long Island has requested bids for double-deck 132-passenger coaches similar to 63 it already has in service, and four modified single-deck coaches of a new 3-2 seat type, each of which would be longer than present single-deck cars and should seat nearly as many passengers as a double-deck car. At east 20 cars of one type or the other will be purchased.

SUMMARY OF MONTHLY HOT BOX REPORTS

Month	Foreign and system freight car mileage (total)	Cars set off between division terminals account hot boxes			Miles per hot box car set off between division terminals
		System	Foreign	Total	
July, 1950	2,745,932,894	....	.....	23,957	114,619
August, 1950	2,937,455,020	7,422	15,490	22,912	128,206
September, 1950	2,974,297,739	6,541	12,881	19,422	153,141
October, 1950	3,165,997,915	4,343	8,935	13,278	238,439
November, 1950	2,868,871,913	2,536	5,331	7,867	364,672
December, 1950	2,813,042,212	2,278	5,968	8,246	341,140
January, 1951	2,840,847,511	2,870	8,436	11,306	251,269
February, 1951	2,425,226,454	4,528	14,063	18,591	130,452
March, 1951	3,063,173,942	3,667	10,078	13,745	222,857
April, 1951	2,996,562,763	3,702	8,914	12,616	237,521
May, 1951	3,013,634,782	5,631	13,737	19,368	155,599

GOULD



REGULAR WATER ADDITIONS

ADD MONTHS TO BATTERY SERVICE!

Specialized equipment makes the watering of car lighting batteries on the road, quick and easy.

The amount of water used by a battery indicates its general condition. That's why regular, systematic watering is so important to maximum battery service. The GOULD PLUS-PERFORMANCE PLAN gives you complete technical information, not only on how to establish a regular watering routine, but on practically every problem connected with storage battery use.

Comprising manuals, articles, specifications, bulletins, charts, graphs and forms, the GOULD PLUS-PERFORMANCE PLAN tells you how to select, charge and handle, maintain and determine the condition of your batteries. Use it consistently and you can improve your battery performance as much as 50%! All material is free. A request will bring descriptive booklet by return mail.

WATERING ROUTINE HELPS KEEP CARS IN SERVICE

Regular watering routine on the road is essential for top battery efficiency and maximum service. When adding water, fill to ⅛" below bottom of filling tubes and no higher. Over-filling results in overflow of electrolyte and subsequent rotting of the wood trays. It also lowers the gravity, reduces battery capacity, damages the battery compartment and causes corrosion and grounds.

As a general rule, a battery in good condition, using more than ½" of water per month, is receiving too much charge. If it uses less than approximately ¼" per month, it is not receiving sufficient charge. All cells should require the same amount of water. If one cell takes more than others, it should be examined for leakage or internal trouble.

Gould "Z" Plate Batteries—America's Finest Car Lighting and Air Conditioning Batteries

GOULD STORAGE BATTERIES

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, NEW JERSEY

Always Use Gould-National Automobile and Truck Batteries

tive. When the Glenwood locomotive maintenance shop was completed in 1919, it contained every modern facility for the repair of steam locomotives and it had a capacity of 500 class, or major, repair jobs a year. Its cost was more than two million dollars. With the new installation for diesel repairs now completed in the shop, it will be possible to do heavy repair jobs on about 200 diesel locomotive units a year, besides handling repairs to component parts, such as traction motors, main generators, engines, injectors, governors, etc.

Beale Becomes Director Ry. Equip. Div., N.P.A.

GUY O. BEALE of Cleveland, Ohio, has been appointed director of the Railway Equipment Division of the National Production Authority, U. S. Department of Commerce. Mr. Beale, who will be on leave as vice-president of the Chesapeake & Ohio, will head the N.P.A. operating

Guy O. Beale

division which has the basic responsibility for allocating controlled materials to the nation's railroad industry, including car and locomotive builders.

Robert Glenn of Sanford, Florida, who has been hitherto serving as acting director of the division will continue as deputy director under Mr. Beale.

Roads Asked Not to Scrap Heavier Type Locomotives

IN a recent letter to the railroads, Defense Transport Administrator James K. Knudson asked the carriers not to scrap any usable coal-burning steam locomotives having 50,000 lb. of tractive force or over. The request also covered such locomotives that can be made usable without excessive use of critical materials.

Roads receiving diesel-electric power and planning to scrap steam locomotives of this size should notify the D.T.A., Mr. Knudson said. He asked that such notification set forth in detail the facts and reasons scrapping is desired, and he promised D.T.A. would take prompt action on such notices.

Mr. Knudson said his letter to the railroads was to help them get a clearer understanding of what was desired at a time when they were being urged to increase their scrap contributions.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of May 1951	Month of May 1950	Five Months ended with May 1951	Five Months ended with May 1950
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	25,455	29,145	134,229	136,221
3-06	Total, Diesel-electric	23,106	17,047	105,856	80,596
3-07	Total, electric	853	824	4,126	4,017
3-04	Total, locomotive-miles	49,415	47,020	244,230	220,857
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,774	1,612	8,638	7,402
4-06	Empty, total	928	864	4,298	4,039
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	45,024	49,684	229,599	219,303
6-02	Total in oil-burning steam locomotive trains	12,781	12,516	61,329	55,883
6-03	Total in Diesel-electric locomotive trains	65,365	48,131	295,974	226,603
6-04	Total in electric locomotive trains	2,388	2,170	11,328	10,476
6-06	Total in all trains	125,567	112,524	598,320	512,369
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.04	1.05	1.05	1.05
10-02	Loaded freight car-miles	39.70	38.30	39.30	37.40
10-03	Empty freight car-miles	20.80	20.60	19.60	20.40
10-04	Total freight car-miles (excluding caboose)	60.50	58.90	58.90	57.80
10-05	Gross ton-miles (excluding locomotive and tender)	2,813	2,677	2,724	2,590
10-06	Net ton-miles	1,316	1,217	1,273	1,162
12	Net ton-miles per loaded car-mile (M-211)	33.10	31.70	32.40	31.10
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	65.70	65.10	66.80	64.70
14	Averages per train hour (M-211):				
14-01	Train miles	17.30	17.10	16.90	17.00
14-02	Gross ton-miles (excluding locomotive and tender)	47,942	45,168	45,414	43,480
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	46.50	44.70	46.00	42.50
14-02	All	44.40	41.70	44.00	39.50
15	Average net ton-miles per freight car-day (000) (M-240)	964	860	950	795
17	Per cent of home cars of total freight cars on the line (M-240)	39.20	42.30	36.10	46.50

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	9,989	11,485	54,525	56,022
3-06	Diesel-electric	16,504	14,059	78,556	69,918
3-07	Electric	1,632	1,546	8,083	7,910
3-04	Total	28,124	27,090	141,164	133,850
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	270,704	252,756	1,360,916	1,281,535
4-09	Total in coal-burning steam locomotive trains	51,857	58,260	287,447	283,019
4-10	Total in oil-burning steam locomotive trains	32,024	33,692	166,383	171,838
4-11	Total in Diesel-electric locomotive trains	16,4995	144,592	820,796	740'668
12	Total car-miles per train-miles	9.41	9.10	9.49	9.33

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	1,223	1,415	6,549	6,945
1-02	Steam, oil-burning	244	234	1,230	1,108
1-03	Diesel-electric[1]	2,988	2,454	14,441	11,659
1-06	Total	4,481	4,130	22,353	19,843
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	48	56	258	307
2-02	Steam-oil-burning	12	12	66	64
2-03	Diesel-electric[1]	244	222	1,196	1,104
2-06	Total	338	324	1,689	1,644
3	Hours per yard locomotive-day:				
3-01	Steam	7.60	7.70	8.10	7.50
3-02	Diesel-electric	17.30	17.10	17.60	17.30
3-05	Serviceable	14.20	13.70	14.50	13.80
3-06	All locomotives (serviceable, unserviceable and stored)	12.20	11.50	12.60	11.40
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.74	1.77	1.78	1.85
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.78	0.80	0.77	0.80

[1] Excludes B and trailing A units.

GOOD ENOUGH*

We must beware of "good enough."
It isn't made of sterling stuff.
It's something any man can do,
It marks the many from the few.
It has no merit to the eye,
It's something any man can buy.
Its name is but a sham and bluff,
For it is never "good enough."

With "good enough" the shirkers stop,
In every factory, school and shop,
With "good enough" the failures rest
And *lose* to men who give their best.
With "good enough" the car breaks down,
And many fall short of high renown;
We must, remember and be wise,
In "good enough" disaster lies.

With "good enough" have ships been wrecked.
The forward march of armies checked.
Great buildings burned and fortunes lost,
Nor can the world compute the cost
In life and money it has paid
Because at "good enough" man stayed.
Who stops at "good enough" shall find
Success has left him far behind.

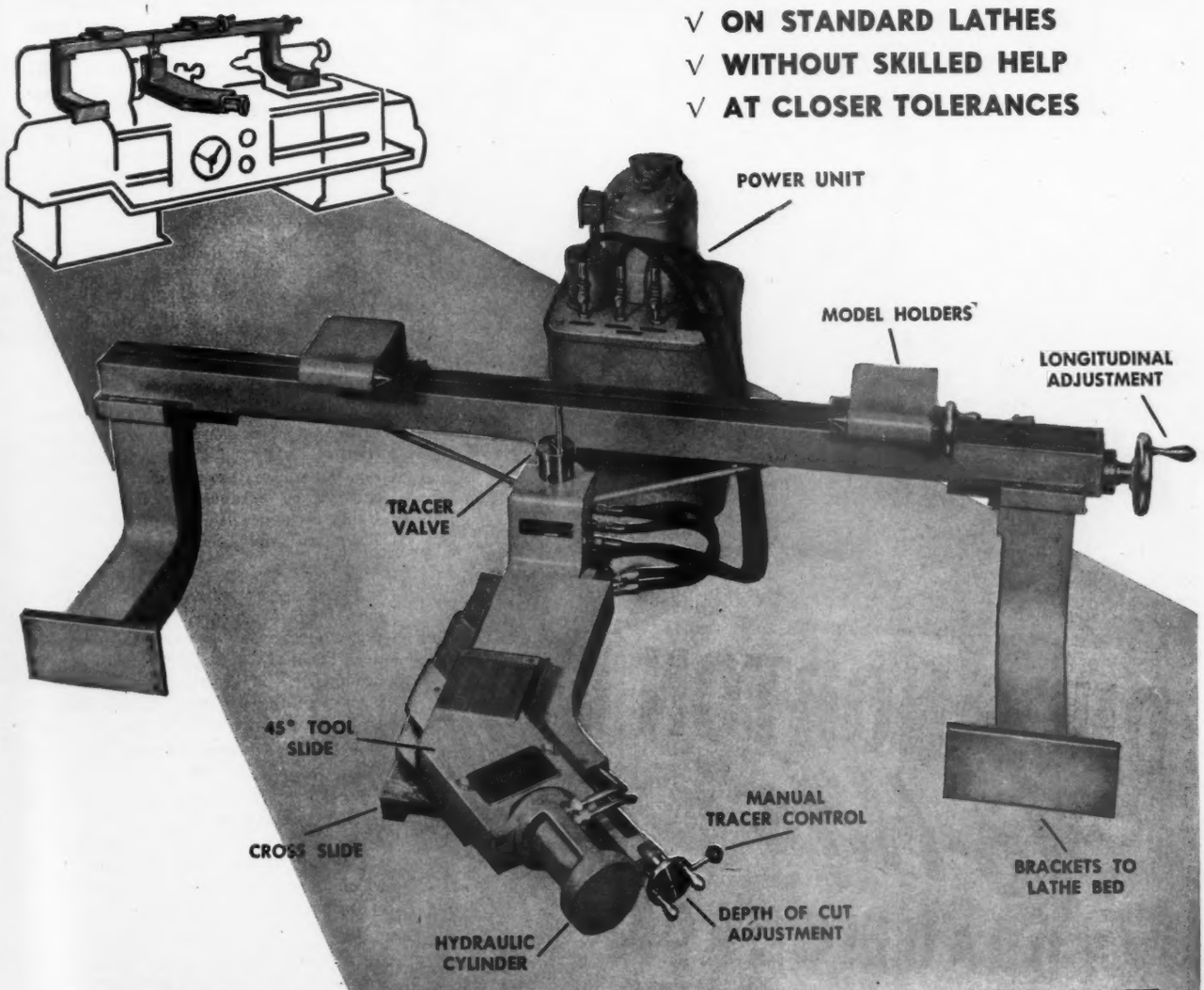
There is no "good enough" that's short
Of what you can do and you ought;
The flaw which may escape the eye
And temporarily get by.
Shall weaken underneath the strain
And wreck the shop or car or train,
For this is true of men and stuff,
Only the best is "good enough."

* Written and presented by E. P. Fairchild, General Boiler Inspector, Atlantic Coast Line, before a meeting of the Safety Committee Secretaries Conference at Jacksonville, Fla., on June 8, 1951.

Here's how locomotive shops using Turchan Follower Attachments

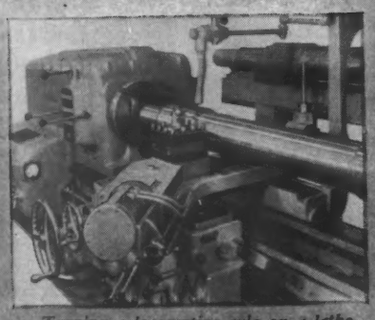
Get 4 to 6 times faster production

√ ON STANDARD LATHES
√ WITHOUT SKILLED HELP
√ AT CLOSER TOLERANCES



The Turchan Follower Attachment is a hydraulic duplicator that replaces the regular cross slide, operating at a 45° angle to the work axis. The cutting tool takes uninterrupted cuts and reproduces the model to tolerances of .001". Jobs such as motor shafts, spindles, valve stems, back shafts, piston rods, axles—in fact, any shaft regardless of length, number of steps, tapers and radii is ideally produced on Turchan equipped lathes. Hydraulic duplicator attachments increase the versatility of your present machines, and eliminate the need for special form tools. There are also Turchan attachments for milling machines, planers, shapers and grinders. "Turn to Turchan to cut costs."

SEND FOR DESCRIPTIVE FOLDER



Turning a locomotive axle on a lathe equipped with the above Turchan duplicating attachment, in 2 hours instead of 8 hours.

WRITE US TODAY: Send a sketch and specification of any lathe job. Give make of machine. We'll show you how to produce it better, faster, at lower cost.

Turchan FOLLOWER MACHINE CO. [illegible]

OLDEST MANUFACTURER OF HY[illegible]

For renewing locomotive spring pins, shackle pins, wearing pads, and for all lifting jobs in low quarters

Spring being jacked into position with the "Lo-Hite" Jack for coupling up hangers in running repair work.

DUFF-NORTON
"Lo-Hite"
HYDRAULIC JACK
... with independent pump

Notice in the photo above that the jack (only 4½" high) is spotted in a closely confined area while the independent pump is out in the open, making jacking easy. This jack will lift a 30 ton load two inches—can be used in vertical or horizontal position.

Write for Bulletin AD-3R.

STRENGTH, SAFETY, DURABILITY
DUFF-NORTON JACKS
ESTABLISHED 1883

THE **DUFF-NORTON** MANUFACTURING CO.
MAIN PLANT and GENERAL OFFICES, PITTSBURGH 30, PA.—CANADIAN PLANT, TORONTO 6, ONT.
"The House that Jacks Built"

SUPPLY TRADE NOTES

GENERAL MOTORS CORPORATION.—The *Hyatt Bearings division* of General Motors has completed preliminary plans for expansion of manufacturing areas in its Harrison, N. J., and Clark Township plants. New structures at the Clark Township plant will provide an additional 390,000 sq. ft. of floor space, doubling existing facilities, and alterations to the Harrison plant will provide an additional 12,000 sq. ft. of manufacturing area.

◆

INDEPENDENT PNEUMATIC TOOL COMPANY.—Independent Pneumatic Tool Co., Aurora, Ill., has transferred its Cincinnati branch to a new, modern building at 3726-3726-28 Floral avenue.

◆

PENNSYLVANIA SALT MANUFACTURING COMPANY.—This company has opened a district sales office at 1618 Irwin-Keasler building, Dallas, Tex. The new office will be sales and service headquarters for Texas and Oklahoma and will be headed by *Hugh W. Temple*, district sales manager.

◆

AMERICAN STEEL & WIRE CO.—*Thursman Haskell* has been appointed special representative in the western area sales department of American Steel & Wire, with headquarters in Chicago. Mr. Haskell has been with the company (a subsidiary of U. S. Steel) since 1919. He has been sales manager at Salt Lake City and at Denver.

◆

JOSEPH T. RYERSON & SON, INC.—*Paul L. Wright* has been appointed sales manager of the Ryerson plant at Buffalo, N. Y. Mr. Wright formerly was office manager, in which capacity he served also as supervisor of the company's inside sales department.

◆

AMERICAN BRAKE SHOE COMPANY.—*Arthur N. Dugan*, vice-president of the *National Bearing Division* of American Brake Shoe, has retired after 37 years of service. Mr. Dugan will continue with the company as a consultant.

◆

MERCURY MANUFACTURING COMPANY.—*Frank M. Ruse* has been appointed midwest transportation sales representative for the Mercury Manufacturing Company, Chicago.

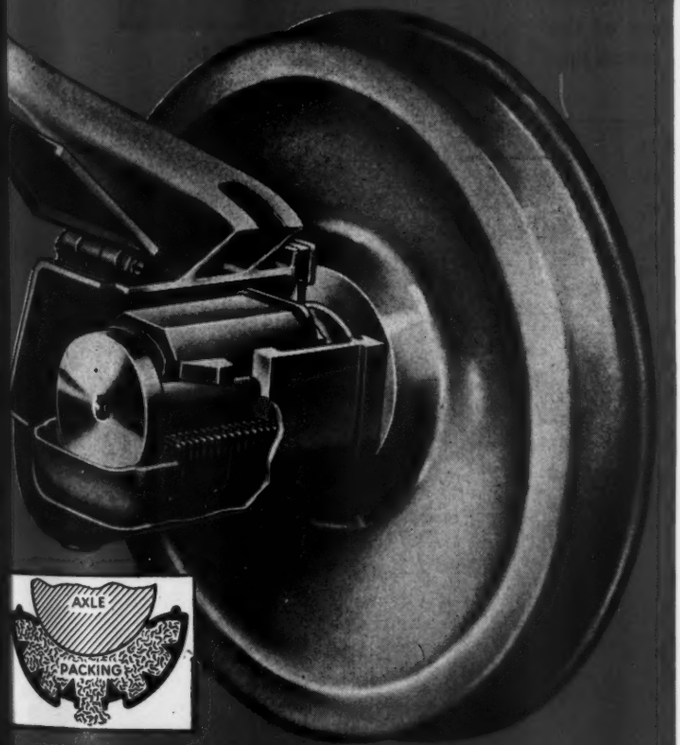
◆

FLEXITALLIC GASKET COMPANY.—The Flexitallic Gasket Company, Camden, N. J., has appointed *Hyslop Brothers*, Chicago and Los Angeles, as agent serving the railroad industry.

◆

NATIONAL MALLEABLE & STEEL CASTINGS Co.—The National Malleable & Steel Castings Co. will build a new physical testing laboratory for railway engineering development work, at Cleveland, at a cost of $750,-

PENNSYLVANIA RAILROAD NOW EQUIPPING 500 CARS



Cutaway journal box and drawing shows Flex-Pak in position in box.

IN CONTINUATION OF TESTS instituted more than a year ago, the Pennsylvania Railroad is equipping 500 70-Ton Class H21A hopper cars with the Hulson Flex-Pak.

The Hulson Flex-Pak is a new type of journal waste container and retainer of synthetic rubber composition. Compounded to be oil resistant, Flex-Pak provides a resilient cushion holding the waste against the full length of journal at the proper pressure for adequate lubrication under all conditions of transit, impact, and temperature. Flex-Pak replaces approximately ½ of the journal packing.

HULSON CO.

332 SOUTH MICHIGAN AVENUE CHICAGO 4, ILLINOIS

HULSON FLEX-PAK®

A.A.R. APPROVED AND PROTECTED IN INTERCHANGE

We can now supply reasonable quantities of Flex-Pak for 5 x 9, 5½ x 10 and 6 x 11 standard A.A.R. freight car journals.

Application bulletin #1 is now being distributed to our mailing list. Additional copies will be mailed promptly on request.

Ann Arbor
Bessemer & Lake Erie
Canton R. R.

Northern Pacific
Pittsburgh & W. Va.
Seaboard

Texas & New Orleans
Youngstown & Northern
Peoria & Eastern

These Roads *have proved* that Mechanized Cleaning of Diesel Parts Saves Time and Labor Costs!

There's nothing like actual use of the Magnus Mechanized Method to prove its worth—as these railroads have found. Many of the larger systems have completely Magnusized their diesel shops and outlying points. Why?

The Magnus Method thoroughly cleans more parts in one-tenth the time normally required in a soak tank or vat. It eliminates up to 95% of hand labor, and saves up to 60% in material cleaning costs. And, initial equipment-chemical costs are surprisingly low.

MECHANIZE TO SAVE! The Magnus Aja-Dip with Magnus Decarbonizing Compound speeds cleaning of these average diesel parts:

Heads	2 hours	Blowers	20 minutes
Liners	2½ hours	Valves	50 minutes
Rods	20 minutes	Strainers	10 minutes
Pistons	20 minutes	Misc. Parts,	5 to 12 minutes

Cleaning the Magnus way is only a one-man operation.

Why go along with slow, costly, outdated cleaning methods when mechanizing with Magnus CAN save your road real money? Phone or write for complete information.

Railroad Division

MAGNUS CHEMICAL COMPANY • 77 South Ave., Garwood, N. J.

In Canada—Magnus Chemicals, Ltd., Montreal

Magnus CLEANERS AND CLEANING EQUIPMENT

Representatives in all principal cities

000. Kenneth L. Selby, chief engineer of the railway division, will direct the activities of the laboratory. The building and test tracks will occupy approximately five acres of land acquired for this purpose and the main laboratory building, to be located on Woodhill road and Woodland avenue adjacent to the company's Cleveland works, will have about 14,000 sq. ft. of space, with completely independent service facilities.

◆

AMERICAN BRAKE SHOE COMPANY.—*John F. Ducey, Jr.*, and *S. R. Watkins* have been appointed assistant vice-presidents in the

J. F. Ducey, Jr.

S. R. Watkins

sales department of the Brake Shoe & Castings division of American Brake Shoe. Both men formerly were district sales managers for the division.

◆

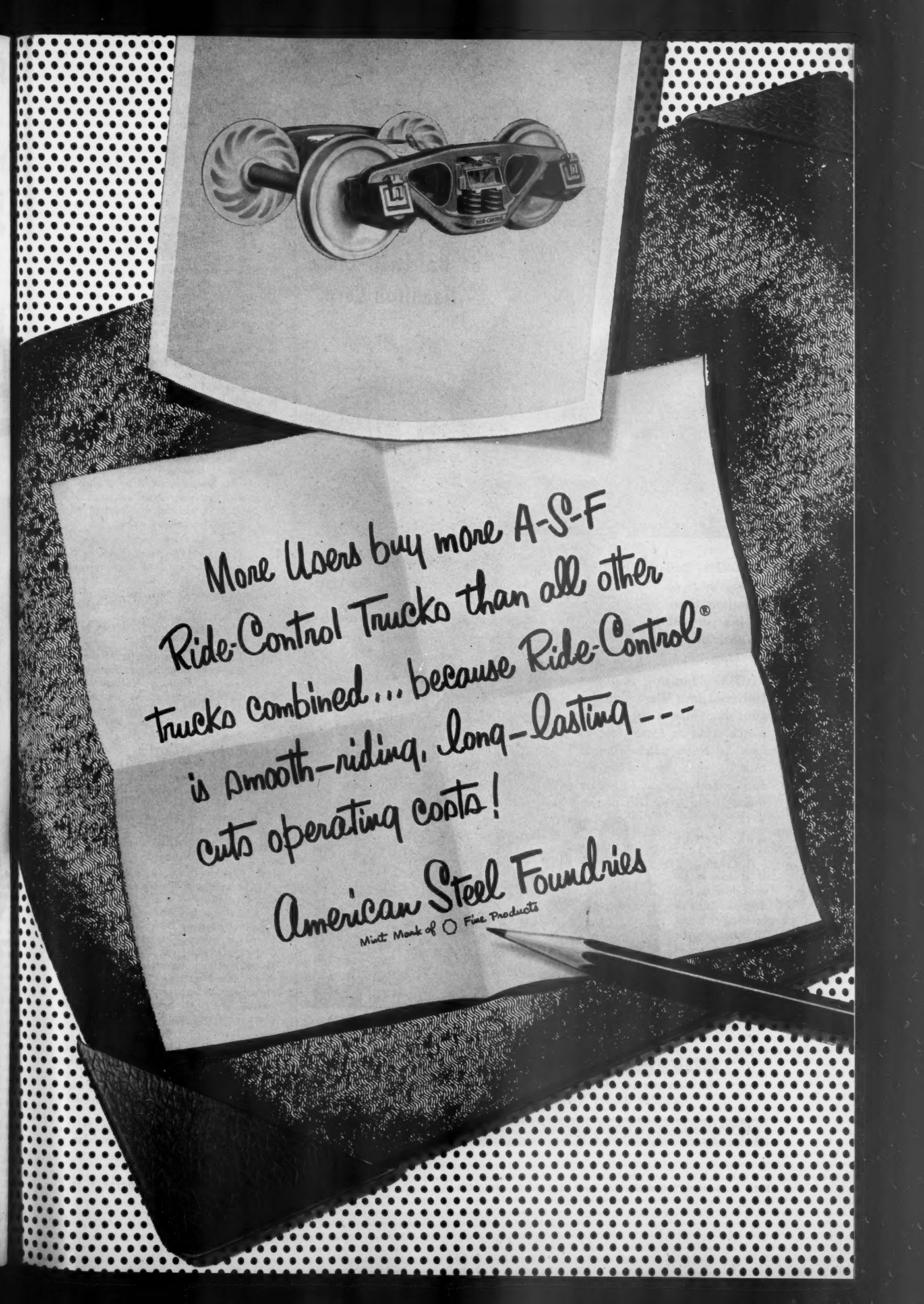
MICROMATIC HOME CORPORATION. *William H. Harris, Jr.*, has been elected vice-president in charge of engineering at Detroit. Mr. Harris was previously chief engineer.

◆

GENERAL MOTORS CORPORATION.—The *Hyatt Bearings Division* of General Motors Corporation has announced the appointment of *Frank H. Webster* as assistant manager—western division, Chicago.

◆

BOWSER, INC.—Bowser, Inc., Chicago, has acquired ownership of the *National Scientific Laboratories, Inc.*, 2010 Massachusetts


More Users buy more A-S-F
Ride-Control Trucks than all other
trucks combined... because Ride-Control®
is smooth-riding, long-lasting---
cuts operating costs!
American Steel Foundries
Mint Mark of ○ Fine Products

ABOVE—"Buffalo" No. 8 Bar Cutter biting off 4½ by ⅝ tee clean and fast at Eddystone Division of Baldwin-Lima-Hamilton Corp. in Philadelphia. Machine can operate at a rate of 25 strokes per minute, and can also handle angles, flats, rounds, squares, channels and beams. Massive arc-welded plate frame gives full rigidity for long life.

RIGHT—"Buffalo" No. 2½ Universal Iron Worker in the same shop. Man at left is using punch head at same time as man at right notches angle iron on shear end. Machine also mitres angles and cuts rounds or squares, slits plates.

WHAT IS YOUR PROBLEM?

If it has to do with drilling, cutting, punching or bending metal, "Buffalo" has the machine to speed up the operation. Write us for bulletins on your problem.

BUFFALO "Buffalo" FORGE COMPANY
174 Mortimer St. Buffalo, New York
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING

avenue N. W., Washington, D. C. *Robert I. Sarbacher*, president of National, has been appointed also director of research for Bowser, and will head the product development work of all subsidiary companies. There will be no changes in laboratory personnel.

◆

ALUMINUM COMPANY OF AMERICA.—The Aluminum Company of America is expanding its research facilities with the erection of a new building at the company's Aluminum Research Laboratories at New Kensington, Pa. The new unit, 80 ft. by 170 ft., will increase total floor space at the laboratories by about one-third. Construction is already under way, and the building will be ready for occupancy early next year. The new addition will consist of two bays, one of which will be three stories high, the other two stories. A six-ton mill-type crane will be installed in the first bay to handle heavy research equipment.

◆

PITTSBURGH STEEL COMPANY.—*Charles F. Palmer*, for many years manager of railway sales for the Pittsburgh Steel Company, retired from active duty on August 31. He has been succeeded by *William G. Gray* who has been with Pittsburgh Steel since 1944 as railway development engineer on tubular railway axles.

◆

DEDNOX, INC.—The *Spring Packing Corporation*, of Chicago, has been appointed exclusive national distributor for the railway products of Dednox, Inc., also of Chicago.

Obituary

IDA R. SIMMONS, a director of the Simmons-Boardman Publishing Corporation, publishers of *Railway Mechanical and Electrical Engineer*, died on September 20 at her home in New Rochelle, N. Y., at the age of 66. Mrs. Simmons was a former employee of the publishing company, having joined its service while still in her teens. In 1914 she was married to the late Colonel Edward A. Simmons, then president of the company. Following his death in 1931, she was elected a member of the directorate and thereafter maintained an active association with the company in which she held a large stock interest.

◆

C. ARTHUR DUNN, retired manager of railroad sales division, Ex-Cell-O Corporation, died at his home in Detroit on August 28 following a long illness. Mr. Dunn was born in Detroit on December 23, 1884. He served as general superintendent of the Globe Seamless Steel Tube Company in Milwaukee and subsequently joined the Prime Manufacturing Company also of Milwaukee as manager railroad sales. He joined Ex-Cell-O September 16, 1930, where he served until retirement.

◆

DAVID W. PYE, who retired recently as president of Tuco Products Corporation and as executive secretary-treasurer of the New York Railroad Club, died in New York on September 8, after an illness of many months.

Mr. Pye was born in Brooklyn, N. Y., on November 5, 1876. After receiving a

43 TIMES FARTHER with LUBRIKO GREASE

M-1 SPECIAL!

A.A.R. APPROVED FOR INTERCHANGE

SERVICE REPORT

DATE: 6-19-51

RAILROAD: [redacted]*

CAR #: 2925

RUN: Chicago and Los Angeles

BEARING TYPE: Timken

LUBRICANT: Lubriko M-1 Special

STARTED SERVICE: 3-12-51

MILEAGE: 108,000

FINDINGS: GREASE LEVEL: OK
ROLLERS: Well Coated
GREASE TEXTURE: Good
GREASE COLOR: Good
CIRCULATION: Good
JOURNALS CHECKED: all

GREASE ADDED: None

REPORT BY: MMP

Passenger cars #2925 and #2930 on the [redacted]*, which makes a weekly round trip (4500 miles) between Chicago and Los Angeles, were test lubricated with LUBRIKO M-1 on March 12 of this year.

On June 19, after 108,000 miles of service, these cars were checked. No servicing was required—no additional lubrication was added.

Other cars (not LUBRIKO lubricated) in this same passenger train had to be lubricated every 2500 miles or, during the same period, 43 times.

** Name on request.*

Write today for LUBRIKO Railroad Case Histories!

You are SAFE with LUBRIKO

THE MASTER LUBRICANT

THE BEST WELLS

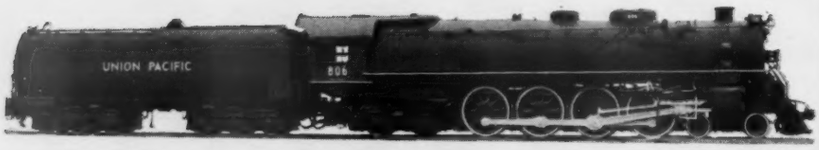
MASTER LUBRICANTS COMPANY PHILADELPHIA, PA.

MANUFACTURERS OF HIGH-GRADE INDUSTRIAL LUBRICANTS FOR OVER 50 YEARS

LOS ANGELES • BOSTON • SAN FRANCISCO

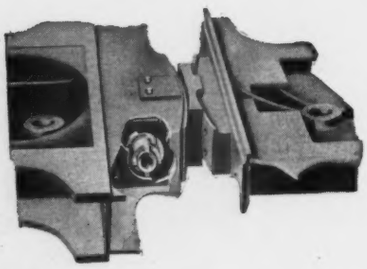
Incorporated 1908 Established 1891

CUT locomotive maintenance COSTS



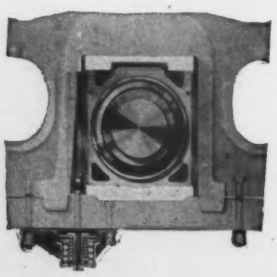
with these TWO SHOCK ABSORBERS

The Franklin E-2 Radial Buffer



The Franklin E-2 radial buffer reduces maintenance by dampening and absorbing horizontal shake and vertical vibration. This results in less wear on chafing plates, drawbars and pins; fewer pipe failures; less displaced brickwork; and fewer loose cabs. It requires minimum attention and will make any locomotive, at any speed, a better riding engine. Crews appreciate the greater comfort it brings.

The Franklin Compensator and Snubber—Equally important with roller-bearing or surface-bearing locomotives, the Franklin Compensator and Snubber keeps the driving box or housing snug in the pedestal jaw, regardless of expansion or wear. It will absorb unusual thrusts and shocks. Driving box pound is eliminated. Wear and the possibility of failure of crank pins and rod bearings are minimized. Tire mileage is extended by reduction of quarter slip.



REG. U.S. PAT. OFF.

FRANKLIN RAILWAY SUPPLY COMPANY

A CORPORATION

NEW YORK • CHICAGO • TULSA • MONTREAL

STEAM DISTRIBUTION SYSTEM • BOOSTER • RADIAL BUFFER • COMPENSATOR AND SNUBBER
POWER REVERSE GEARS • FIRE DOORS • DRIVING BOX LUBRICATORS • OVERFIRE JETS
JOURNAL BOXES • FLEXIBLE JOINTS • TANK-CAR VALVE

RAILWAY DISTRIBUTOR FOR N.A. STRAND FLEXIBLE SHAFT EQUIPMENT

business college education, he entered the railway supply business and was purchasing agent and vice-president of the Safety Car Heating Company before he became associated with Tuco Products, which he later came to head.

Mr. Pye became treasurer of the New York Railroad Club in 1918 and was elected, also, executive secretary early in 1932. He had been a member since 1895. "Dave" Pye was given the title of "Mr. New York Railroad Club" in the inscription engraved on a gold cup the club presented to him following his retirement from active service last November.

David W. Pye

◆

HARRY W. RENICK, vice-president of the Brake Shoe & Castings division and the Ramapo Ajax division of the American Brake Shoe Company, died on August 24, in Los Angeles, after a month's illness.

PERSONAL MENTION

General

B. L. THOMPSON, superintendent of motive power and car equipment, Manitoba district, of the Canadian National at Winnipeg, Man., has been appointed general superintendent of motive power and car equipment, Atlantic region, with headquarters at Moncton, N. B.

J. J. ELKIN, JR., has been appointed assistant to the general superintendent of motive power and equipment of the Baltimore & Ohio, with headquarters at Baltimore.

Y. T. GUINN, equipment inspector of the Chesapeake & Ohio, at Chicago, has been appointed Air-brake inspector, at Huntington, W. Va.

ERIC WYNNE, general superintendent of motive power and car equipment, Atlantic region, of the Canadian National, has been appointed general superintendent of motive power and car equipment, Western region, with headquarters at Winnipeg, Man.

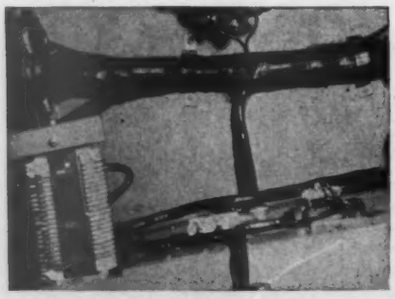
Big improvements for years

LUCAS *Precision*

THERE'S A NEW KIND OF HARNESS ON "THE RANCH"

It's "SCOTCH" No. 33 Electrical Tape—the super-thin, long-lasting plastic tape—that harnesses and insulates all wiring in this famous lounge car, and 74 other cars in Great Northern's new 12 million dollar fleet of trains.

Need a tape that does a big job in small places? Try the tape American Car & Foundry Co. used on the Great Northern's new "Empire Builder"—"SCOTCH" No. 33 Electrical Tape. The smooth plastic backing resists abrasion—oil, water and acid, too. Carries the UL seal. Dielectric strength: 10,000 volts. Sticks at a touch! Order it today!



HARNESSES LIKE THIS electric brake line are only part of the many jobs done with "SCOTCH" No. 33 Electrical Tape on the Great Northern Railway's "Empire Builder."

SCOTCH BRAND Electrical Tape No. 33

The term "Scotch" and the plaid design are registered trade-marks for the more than 100 pressure-sensitive adhesive tapes made in U.S.A. by **MINNESOTA MINING & MFG. CO.**, St. Paul 6, Minn.—also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives.

General Export: Minn. Mining & Mfg. Co., International Division, 270 Park Avenue, New York 17, N. Y. In Canada: Minnesota Mining & Mfg. of Canada, Ltd., London, Canada.

GUY F. WILES, who has been appointed superintendent of motive power of the Baltimore & Ohio at Baltimore, as announced in the September issue, entered the employ of the road in 1909 as a locomotive cleaner in the Grafton, W. Va., shops. In 1915 he transferred to the Mt. Clare shops, where he became a machinist apprentice. During the next six years he

Guy F. Wiles

handled a variety of jobs in both the Mt. Clare and Grafton shops and in 1921 became district motive-power inspector at Wheeling, W. Va., and serving successively at Baltimore. In 1937 Mr. Wiles was appointed special inspector at Baltimore; in 1940, supervisor of diesel locomotive operations for the system at Baltimore, and in 1950 assistant to the general superintendent of motive power and equipment.

FREDERICK A. BALDINGER, who has retired as superintendent of motive power of the Baltimore & Ohio at Baltimore, as announced in the September issue, was born at Crestline, Ohio, on August 23, 1881. He entered railroad service there in 1903 with the Pennsylvania, going with the Washington Terminal four years later. He became employed by the B. & O. in December

Frederick A. Baldinger

1913 at the Mt. Clare shops, and later held various supervisory positions at several points. Mr. Baldinger subsequently served as assistant master mechanic, master mechanic, acting district master mechanic and district master mechanic. In 1942 he was appointed general supervisor

This is the Best Diesel-Electric Traction Motor Brush Money can Buy!

Big Statement? You Bet!

BUT WE CAN BACK IT UP! Into the brush illustrated above, National Carbon Company has built plus factors which make it the finest in the world for its purpose — a brush developed especially for diesel-electric motors. Here's why:

- **"NATIONAL" Grade AZY**—proved by millions of service miles to give longest life with excellent commutator condition, plus remarkable freedom from breakage!
- **"NATIONAL" Permanently-Sealed Shunt Connections** do not pull out. Of millions made to date, *not one pull-out* has ever been reported! These Permanently-Sealed Connections also minimize cable fraying through special internal construction.
- **Exclusive Fray-resistant Cable** gives still further protection, with the result that overall brush dependability is assured!

All three outstanding features available in the following "NATIONAL" STANDARDIZED Brushes

NC 24-7215 — 2 x 2¼ x ¾" (⅜-⅜)
NC 24-5620 — 2 x 1¾ x ¾" (⅜-⅜)
NC 24-6420 — 2⅛ x 2 x ⅝" (5/16-5/16)

The terms "National" and "Plytek" and the Silver Strand Cable device are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.
District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco
IN CANADA: National Carbon Limited
Montreal, Toronto, Winnipeg

BIDDLE

NUMBER 6 OF A SERIES

Instrument News

HERE'S A "GOOD COMPANIONS" KIT FOR PRACTICAL RAILROAD MEN

...signal engineers and maintenance men

MIDGET MEGGER® INSULATION TESTER

(Ratings to 50 megohms, 500 volts D.C.)

Helps detect dirt, moisture and deterioration in electrical insulation in advance of failure.

MIDGET MEGGER® CIRCUIT TESTING OHMMETER

(Measures .01 ohm up to 200,000 ohms)

Measures conductor resistance of coils, contacts and relays. Does in ohms what the Midget Megger Insulation Tester does in megohms.

TWO HANDY INSTRUMENTS

Both instruments complete with case and leads weigh approximately 6 lbs. Signal engineers and electrical maintenance men say this compact kit of instruments saves so much time and trouble it becomes practically indispensable.

NEW BULLETIN

Bulletin 21-85-X is a recently issued, fileworthy piece describing the "Good Companions" Kit and a third instrument—The new CVM Constant Voltage Type Megger Insulation Tester. Send coupon for this bulletin today.

JAMES G. BIDDLE CO.
1316 Arch St., Philadelphia 7, Pa.

Please mail me your new Bulletin 21-85-X. Thank you.

*Name*_____

*Job*_____

*Company*_____

*Address*_____

JAMES G. BIDDLE CO., 1316 ARCH ST.
PHILADELPHIA 7, PA.

ELECTRICAL TESTING • SPEED MEASURING INSTRUMENTS • LABORATORY & SCIENTIFIC EQUIPMENT

of locomotive maintenance and in March 1943 became superintendent of motive power of the Eastern region.

FRANK X. JONES, supervisor fuel and locomotive operation of the Erie, has been appointed supervisor locomotive operation, with headquarters as before at Cleveland. The position of supervisor fuel and locomotive operation has been abolished.

W. F. DADD has been appointed assistant to the general superintendent of motive power and equipment of the Baltimore & Ohio, at Baltimore.

Car

V. L. MINNICK, general foreman of the Norfolk & Western shop at Williamson, W. Va., has been appointed general foreman at the Shaffers Crossing shop at Roanoke, Va.

GEORGE P. BOWMAN, general foreman at the Shaffers Crossing shop of the Norfolk & Western at Roanoke, Va., has been appointed to fill the newly created position of wheel-shop supervisor in the office of the general superintendent of motive power.

Diesel

A. W. FRASER, assistant road foreman of engines of the Central of New Jersey at Jersey City, N. J., has been appointed supervisor of air brake and diesel performance.

Electrical

GEORGE B. LEWIS has been appointed electrical supervisor, Scranton division, of the Delaware, Lackawanna & Western at Scranton, Pa.

Master Mechanics and Road Foremen

D. BEATH, master mechanic of the Manitoba district of the Canadian Pacific, retired from active duty on August 31.

J. J. RABY has been appointed master mechanic of the Manitoba district of the Canadian Pacific.

P. L. HOFSTETTER, assistant division master mechanic of the Riverside shops of the Baltimore & Ohio at Baltimore, has been appointed master mechanic at Punxsutawney, Pa.

W. P. GILFORD, assistant master mechanic of the Hagerstown division of the Western Maryland, has been appointed master mechanic of the Elkins division, with headquarters at Cumberland, Md.

CLARENCE C. CHURCH, district road foreman and fuel supervisor of the Erie at Marion, Ohio, has retired under the pension rules of the company, after 44 years of service.

FRANK L. VAN SCHAICK, district road foreman and fuel supervisor of the Erie at Port Jervis, N. Y., has been appointed assistant supervisor locomotive operation, with headquarters at Jersey City, N. J. The

(Continued on p. 122)

# of new $5,000,000 investment!

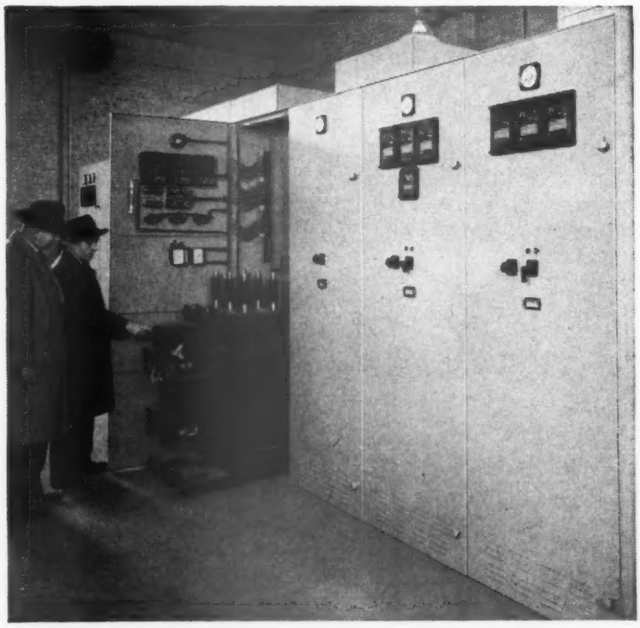
New B&O unloaders move 2000 tons an hour around-the-clock. Continuous power supplied with modern d-c substation and metal-clad switchgear.

Strategic ore from Liberia and South America takes less time to get to the nation's steel producing centers when it is unloaded at the Baltimore and Ohio's new ore facility in the Curtis Bay section of the Port of Baltimore.

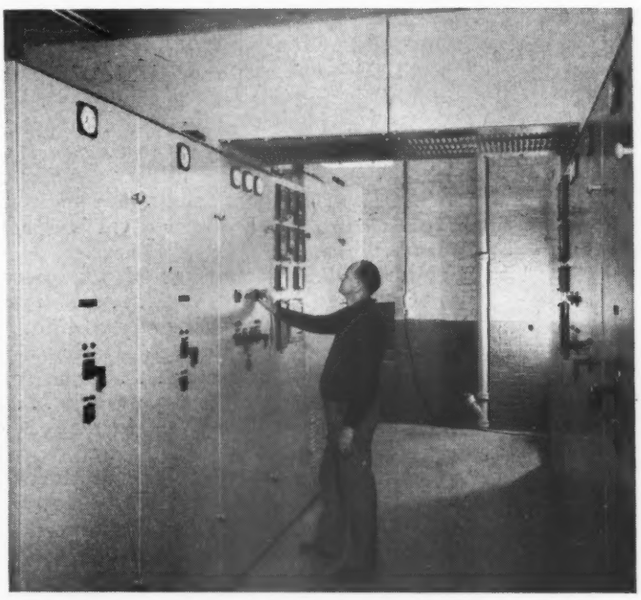
Incorporating the latest improvements in design and equipment, the new ore dock has a working capacity of 2000 tons an hour. The two highly efficient unloaders reduce turn-around time for ore boats and provide an almost continuous stream of ore-laden railroad cars for iron and steel mills. These same cars return to Baltimore loaded with coal, give B & O a two-way pay load for greater efficiency.

Continuous power for 24-hour operation is supplied by modern G-E substations. Two 1000 kw d-c substations supply the main power for the entire installation, while an a-c substation supplies auxiliary power and lighting. G-E metal-clad switchgear provides control and protection for the incoming and outgoing feeders to a-c and d-c load centers.

Forward-looking G-E engineers are ready to apply the knowledge gained from this, and hundreds of other installations, to *your* problems. Investigate today the many advantages of using General Electric switchgear in your plant for efficient, flexible power distribution. Contact your G-E sales representative, or write for bulletin GEA-3083 Metal-clad switchgear. General Electric Company, Schenectady 5, N. Y.



G-E metal-clad switchgear for the 13.2 kv feeders to a-c and d-c substations. All components are metal-enclosed for protection to personnel. Because units are factory-built and arrive ready to install, total installed cost is greatly reduced.



View of the operating aisle of the d-c substation. New G-E pumpless rectifiers provide continuous low-cost d-c power conversion. Minimum number of moving parts reduces maintenance. All parts are easily accessible.

GENERAL ELECTRIC

854-38

protect
• passengers
• performance
• profits

LORD VIBRATION-CONTROL MOUNTINGS

LORD Vibration-Control Mountings are standard equipment on the new G. E. Diesel-Electric Undercar Power Plants. They insure pleasure and comfort by protecting passengers from disturbing engine noise and vibration. Performance is so efficient that passengers seldom realize that a power plant is operating beneath the car.

These LORD Mountings also protect the power plant from road shock . . . enabling it to operate smoothly and efficiently without interference. Instruments and automatic controls maintain original accuracy . . . require fewer adjustments . . . are more dependable . . . need less maintenance. Lower maintenance costs mean more profit to the operator.

If vibration is affecting your product's performance—and costing you sales—now is the time to investigate LORD Vibration-Control Mountings. For information, or for assistance in selecting and applying LORD Mountings, write to attention of Product and Sales Engineering Department.

LORD MANUFACTURING COMPANY • ERIE, PA.

LORD BONDED RUBBER — *Vibration-Control Mountings . . . Bonded-Rubber Parts*

position of district road foreman and fuel supervisor has been abolished.

GEORGE R. LYMING, master mechanic of the Elkins division of the Western Maryland at Cumberland, Md., has retired because of ill health, after 38 years of service with the road.

Shop and Enginehouse

W. M. TUCKER, enginehouse foreman of the Norfolk & Western at Williamson, W. Va., has been appointed general foreman at Williamson.

Obituary

CHARLES P. SLACK, electrical supervisor of the Delaware, Lackawanna & Western at Scranton, Pa., died on August 27. Mr. Slack had been in the employ of the Lackawanna for 40 years.

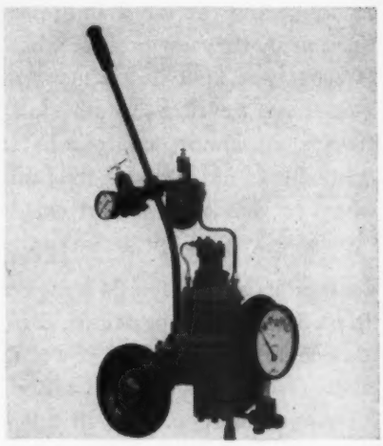
New Devices

(*Continued from p.* 102)

to actuate each of four torches automatically and a master switch for simultaneous control of all torches.

This torch holder can be positioned vertically, 90 deg. left or right parallel to the longitudinal axis of the bar, and with an adaptor can be positioned 90 deg. forward perpendicular to the horizontal axis of the torch bar.

◆



High Pressure Tester

The Intensifier is a new device for utilization where pressure testing is necessary—boilers, piping, compressor cylinders, tanks and similar high pressure vessels, destruction tests in laboratories, etc. A 90 lb. per sq. in. air pressure source will develop up to 23,000 lb. per sq. in. output.

Available in two models, the No. 10 low pressure unit for testing with water has a range from 0 to 10,000 p.s.i. while the No. 23 high pressure device for testing with oil has a range from 0 to 23,000 p.s.i. Both units are developments of The Cooper-Bessemer Corp., Mt. Vernon, Ohio.

Through unique operating principles, they provide complete safety in field and laboratory testing operations where explosive atmospheres are involved.

The unit weighs less than 80 lb. and is

Now, ALL Railroads can put wheel mounting and demounting operations on a real production basis with new, modern W-S Wheel Mounting and Demounting Presses.

Incorporating outstanding design and construction features, these latest developments of W-S Engineers provide the fastest cycle of operation ever attained in this type of equipment, and they handle any type of wheels.

MOUNT and DEMOUNT in Seconds with NEW W-S WHEEL PRESSES

300 TON STRAIGHT THROUGH MOUNTING PRESS

Smashing time records daily, these New Watson-Stillman Speed Presses permit YOU to set your own floor-to-floor speed time—and this is only limited by your loading and unloading facilities.

Get the story today from one of the W-S Representatives listed below.

600 TON STRAIGHT THROUGH DEMOUNTING PRESS

WATSON-STILLMAN

HYDRAULIC MACHINERY DIVISION ESTABLISHED 1848

Factory and Main Office: ROSELLE, NEW JERSEY • Branch Office: CHICAGO, ILL.

Manufactured in Canada by CANADIAN VICKERS, Ltd., MONTREAL

REPRESENTATIVES

Chicago 4, Ill. ..... W. R. Walsh
Denver 2, Colo. ..... Overgard Machine Tool Co.
New York 17, N. Y. .... Eastern Railway Supplies, Inc.
St. Paul 4, Minn. ..... Anderson Machine Tool Co.
San Francisco 5, Calif. ..... Overland Supply Co.
Washington 5, D. C. ..... Ralph Payne

9-K-12

delivered ready to go to work as it is equipped with a short length of connecting, high pressure tubing with a ¾ in. 16 TPI coupling.

◆

Copper Ammonium Fluoride Complex

A free-flowing, powdered copper ammonium fluoride complex, soluble in water, is being made available for evaluation purposes by the Pennsylvania Salt Manufacturing Company, 1000 Widener building, Philadelphia 7. The product is offered for use as a termite- and rot-proofing agent for wood and as a mildew-proofing agent for textiles. Studies with a variety of woods indicate that the copper ammonium fluoride complex, when dissolved in water and diluted to 0.5 per cent copper, exhibits excellent penetration characteristics. After drying, the wood shows resistance to leaching superior to similar samples treated with zinc chloride or copper sulfate. Stake tests run over a period of more than five years indicate that protection conferred by copper ammonium fluoride is greater than that obtained by treatment with zinc chloride.

The dry formulation represents an improvement over liquid copper ammonium fluoride solutions in that dilutions as low as 0.04 per cent copper may be made without the necessity of adding ammonium hydroxide in order to maintain stability.

In application, wood may be sprayed, soaked, brushed or pressure impregnated with solution prepared from the copper ammonium fluoride.

◆

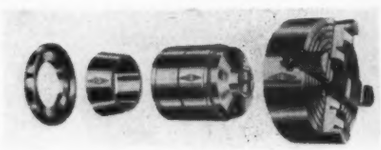
Rubber Frame Goggle

A rubber-frame goggle, designed to provide a gas-tight seal and recommended specifically for gas, fume and smoke hazards, is announced by the American Optical Company, Southbridge, Mass.

The 701 goggle is constructed without any ventilation slots in the rubber frame to prevent infiltration of air. When the goggle is perfectly fitted, a gas-tight seal results. The headband of the goggle enters slots in the outer goggle frame and not through a slit in the lens. Also, screw-headed bolts on the front of the goggle are made of non-corroding stainless steel.

The goggle may be obtained in combination with American Optical's R2000 or R5000 respirators. These combinations can be supplied permanently riveted together or as separate units.

◆

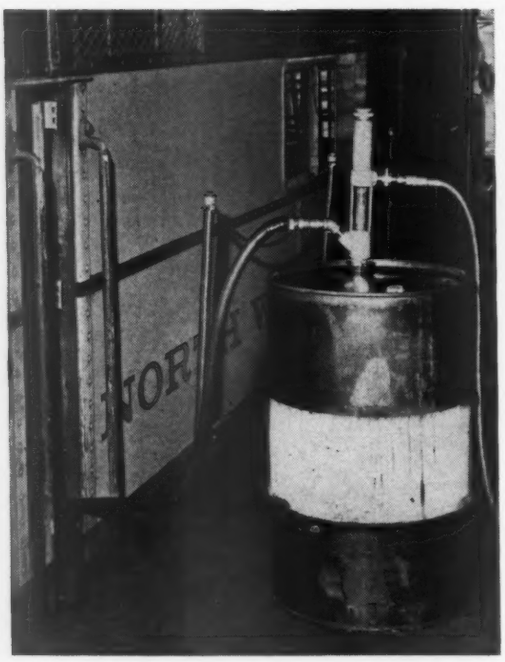


Outside Spindle Type Center

A Red-E anti-friction superaccurate center that mounts to an independent chuck is the latest development of the Ready Tool Company, 554 Iranistan avenue, Bridgeport, Conn. It was designed to provide an accurate center for special applications such as for turning irregular shaped pieces and for accurate alignment to the headstock when turning uncentered work such as forgings, castings, crankshafts and other pieces.

The anti-friction type center is mounted to the outside spindle of the tailstock and held securely by a hardened and ground tapered bushing. It can be made to fit any size or make chuck.

(*Continued on p.* 128)



CHICAGO NORTH WESTERN SYSTEM · UNION PACIFIC · FRISCO · Rock Island · ERIE · GM&O · PRR · Atlantic Coast Line · Illinois Central

WILKINSON

High Speed Diesel Lube Oil Transfer Pump

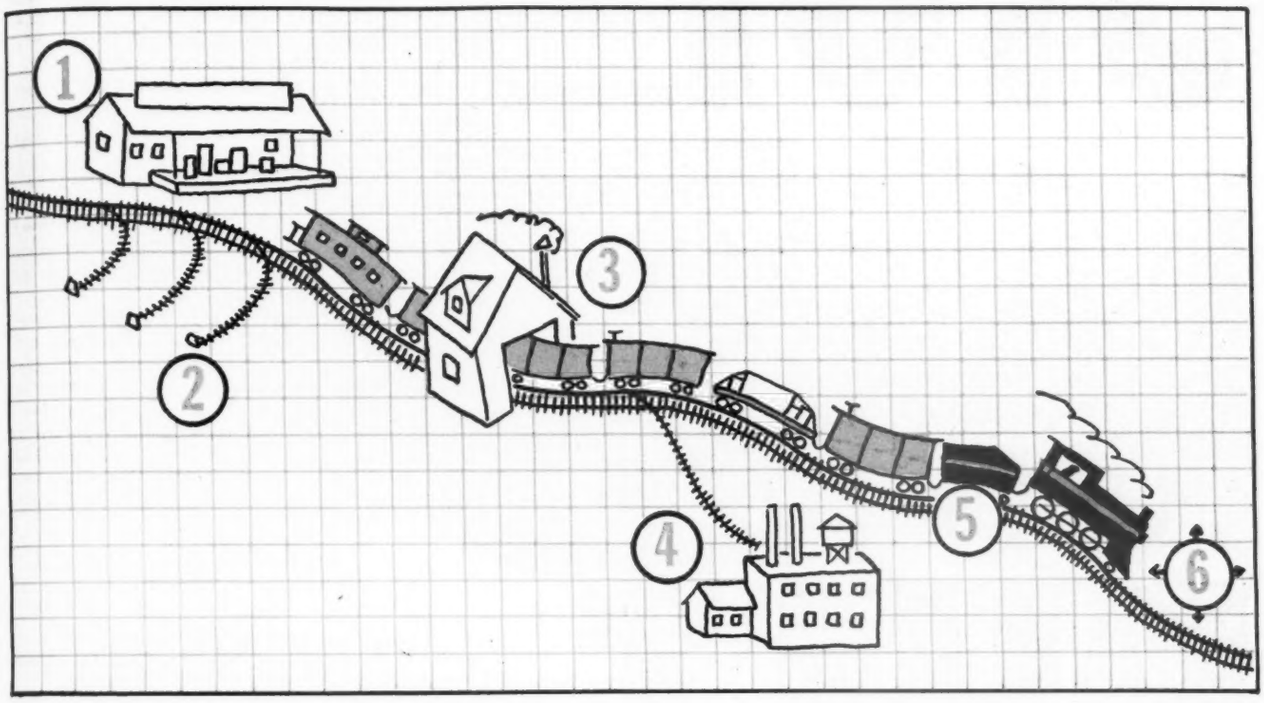
REDUCE your Diesel lube oil handling time by more than 41% and eliminate oil spillage. Use the WILKINSON light-weight air-operated transfer pump. Only weighs 15 lbs. and **no air enters barrel.**

You can pump a 55-gal. barrel S.A.E. #40 lube oil in 5 minutes with only one man.

Can furnish ready-to-use,—package consisting of WILKINSON Transfer Pump, 35 feet of ¾" oil hose, and automatic shut-off valve.

HUDSON 3-5221
WILKINSON EQUIPMENT & SUPPLY CORP.
6958 SOUTH WENTWORTH AVENUE
CHICAGO 21 ILLINOIS

Operating costs come down *all along the line*...with "Roller Freight"



1 **AT TERMINALS**—Man-hours needed for journal inspection are reduced 90% when freight trains are mounted on Timken® tapered roller bearings!

2 **IN THE YARDS**—"Roller Freight" makes more cars available because cars can get where they're going faster and spend less time in repair shops. Humping operations cannot displace parts of the Timken bearings.

3 **IN THE SHOP**—There are fewer repair jobs needed on draft gear and other parts when freight cars roll on Timken bearings. Timken bearings make it possible to eliminate impact damage from serial starting.

4 **AT DESTINATIONS**—Damage claims are reduced because "Roller Freight" makes possible smoother starts and stops. Timken bearings cut starting resistance 88%.

5 **ON THE ROAD**—"Roller Freight" practically eliminates "hot boxes" and the resulting expenses and delays. Timken roller bearings minimize friction. And there's no waste to "grab".

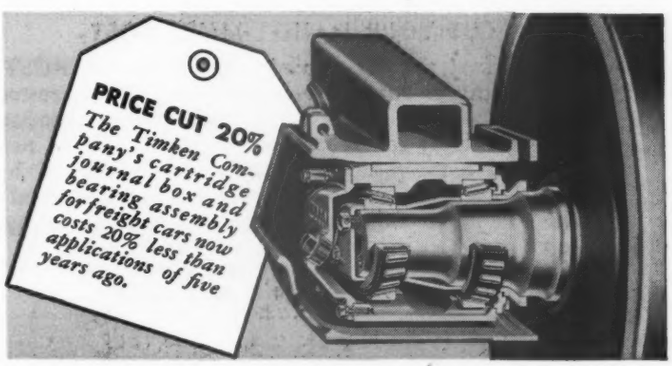
6 **ANYWHERE**—Timken bearings reduce starting friction to a minimum. You can schedule full-length trains even in cold weather!

MORE BUSINESS, TOO! "Roller Freight" not only cuts your operating costs. It also gives you a big, competitive talking point with shippers in your bid for a greater share of tomorrow's freight tonnage. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS


PRICE CUT 20%
The Timken Company's cartridge journal box and bearing assembly for freight cars now costs 20% less than applications of five years ago.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▱ BEARING TAKES RADIAL ◫ AND THRUST ◫ LOADS OR ANY COMBINATION ✳

STOP RUST

Available in many colors, aluminum and white.

RUST-OLEUM can help you control rust—to cut your maintenance costs—and to avoid needless rust losses. It stops rust effectively—and prolongs the useful life of rustable metal so that costly replacements can be deferred years longer than previously could be expected.

Railroads find RUST-OLEUM the practical answer to many rust problems. Its tough, pliable film gives excellent protection to rolling stock, bridges, tanks, metal buildings, signal equipment and other properties.

CUT YOUR MAINTENANCE COST

Rescue metal that has already started to rust. RUST-OLEUM can be applied *even* over metal already rusted —usually without sandblasting or the use of chemical cleaners. Simply scrape and wire-brush to remove rust scale and loose rust. Then apply RUST-OLEUM by brush, dip, or spray. It stops the rust, and promptly dries to a firm, pliable, rust resistant protective coating.

Write for your copy of the RUST-OLEUM Railroad Catalog

RUST-OLEUM CORPORATION

2590 Oakton Street **EVANSTON, ILLINOIS**

Air-Pressurized Fire Extinguisher

Now on the market is a completely new 1 qt. air-pressurized fire extinguisher, designed and introduced by the American-La France-Foamite Corp., Elmira, N. Y. This unit discharges vaporizing liquid fluid for extinguishing both flammable liquid and electrical type fires such as class B and C fires.

The extinguisher, called Alfco Pressurized Fire-Gun, carries the inspection and approval label of Underwriters' Laboratories.

The device aims and operates like a gun, with trigger-quick action, and hits the fire target accurately with no unnecessary loss of liquid. It requires no pumping. Anyone can operate it, and with one hand.

It is an ideal unit for protecting autos, trucks, trailers, airplanes, street and railroad cars, motor boats, garages, and electrical equipment and will stop small oil and grease fires from becoming big blazes.

The extinguisher is easily recharged by simply pouring in more vaporizing fluid. Pressure can be applied with any standard air chuck as commonly used in gasoline service stations.

◆

Lightweight Dust Hood

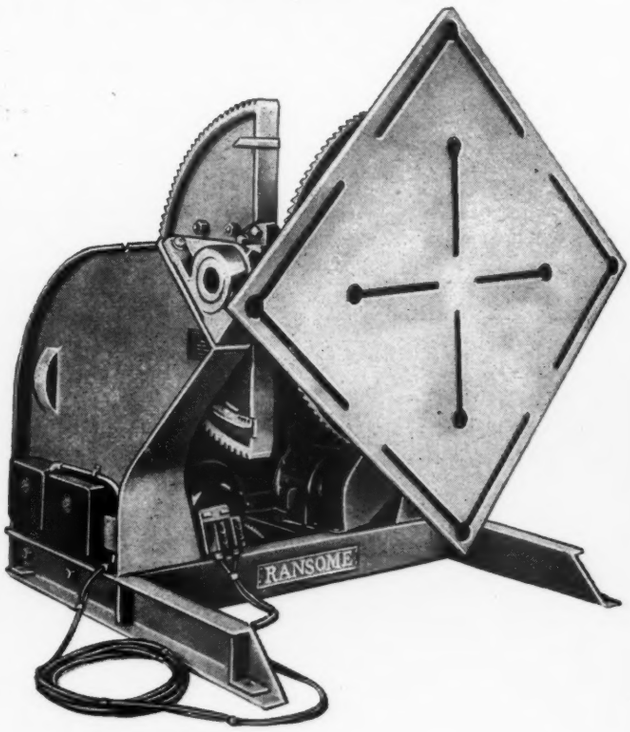
A new type lightweight dust hood, announced by Willson Products, Inc., Reading, Pa., has easily interchangeable frames and windows which make possible the use of one hood either with or without a respirator. The hood itself is of lightweight cotton duck, and a close but comfortable fit is obtained by adjustable neck and underarm web straps.

Extra-large windows of .040-in. nonflammable acetate sheeting, which provide ample vision for extra safety, can be replaced without removing the frame. The frames of semi-rigid fibre can be easily removed by means of snap fasteners for cleaning when necessary.

(*Continued on p.* 134)

Lots of Different Pieces or Lots Alike...

THIS POSITIONER PAYS OFF



in more production . . . better welds . . . less rod waste

The universal table top makes the Worthington-Ransome Welding Positioner as profitable on *job* work as it is in mass production.

Those "T" slots make the table adaptable to any shape of work piece and a wide range of sizes. No special jigs or fixtures needed.

Whether you produce "thousands alike" or "every one different", benefit from *increased arc-time* with Worthington-Ransome Welding Positioners. With just one set-up, the work is clamped to the table top. Then push-button controls or simple hand cranks do the work of tilting or rotating into any position convenient for economical downhand welding. Your welder can continuously weld without costly time and labor wasted in frequent rehandling of the work.

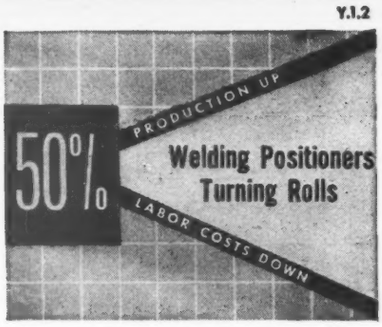
Result—up to 50% more footage, *better* welds (using higher current and heavier rods), less welding rod waste.

Welding positioner capacities from 100 lb to 30 tons. Also: turning rolls from 3 to 150 tons, stationary or self-propelled.

Write Worthington Pump and Machinery Corporation, Dunellen, New Jersey, for bulletins or additional information.

Y.1.2

WORTHINGTON



With the respirator window and frame assembly, the hood will accommodate respirators which provide a high degree of protection against dusts and low concentrations of common industrial gases and vapors.

◆

Plastic Cover Plate

A new plastic cover plate affording greater protection for welding helmet windows is announced by the American Optical Company, Southbridge, Mass. The plate, made from special thermosetting plastic, is clear, hard and almost colorless, possessing surfaces comparable in smoothness, lustre and chemical resistance to polished plate glass. It is more resistant to pitting than glass, will not discolor under ordinary welding conditions, and will not peel, crack, blister or shrink in service. The plate, it is said, will last longer than glass and will give up to 1,000 hrs. of service.

◆

Spotwelding Control System

A new control system that extends electrode life 20 to 30 times when spotwelding aluminum with ordinary single-phase a.c. welders has been developed by the Reynolds Metals Co., Louisville 1, Ky.

Known as Slope Control, it is in effect a variable resistor connected in series with the heat control potentiometer to reduce welding current during the first few cycles of the weld, allowing it to build up gradually to maximum welding current.

The control cuts the total amount of heat produced in the welding tip to less than one sixth normal temperature. This in turn means that sticking and deposition of aluminum on the electrode tips are greatly reduced because deposition of aluminum is directly proportional to the temperature at point of contact.

With this control, the aluminum softens at the tip-work interface and allows the tip to sink into the work slightly before the full welding current is applied. When maximum welding current is reached, there is a considerable portion of the tip surface contacting the work and current is distributed over this entire area so that high current densities do not occur. This, in turn, prevents sticking, the major obstacle to quality work.

◆

In the LONG RUN...
Truarc Retaining Rings
Resilient Stop Plates Prevent Axle Scoring
Easily Replaceable Unit Wick Set
Patented and Patents Pending
IT COSTS LESS TO LUBRICATE WITH MODERN
FELPAX Lubricators
Here's Why...
Maintenance reduced to a minimum of periodic checking and filling the oil sump.
Special Felt Wicks last thousands of miles without attention and eliminate waste grabs.
New, Improved Construction simplifies replacing worn out wicks. Inexpensive replacement kits make reconditioning of lubricators a fast, simple operation.
ON "HOT-SHOT" or "LOCAL"—you can be sure every journal is getting full continuous lubrication when modern FELPAX Lubricators are in each axle cap. Waste grabs and starved bearings due to improper packing of old fashioned yarn are eliminated. Special Felt Wicks in constant contact with the journal provide full, continuous lubrication from the first turn of the axle.
For Full Information about Modern FELPAX Lubricators see your locomotive builder or write to:
Miller Felpax Corporation
WINONA, MINNESOTA
FELPAX

Functional Design Fire Detector

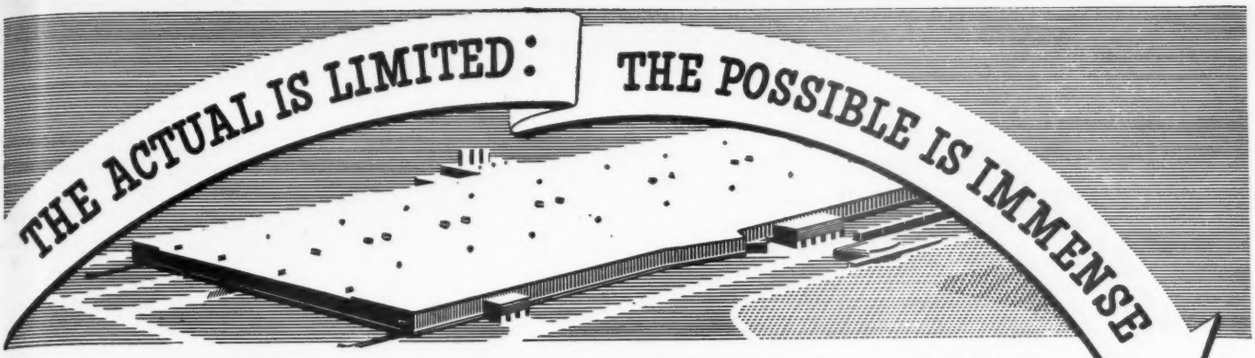
Employing a new principle of fire detection described as "Rate Compensation," Fenwal, Inc., Ashland, Mass., has just marketed a fire detector.

The fixture fits snugly and unobtrusively against the ceiling and is mounted in a curved steel case. It can be installed within new or existing alarm systems, or can be made to actuate an extinguishing system directly.

Called the Detect-A-Fire, the unit has the property of giving an alarm precisely at the moment the surrounding air reaches the temperature for which the device is set. For example, if fire warning is desired at 140 deg. F., the device is pre-set for this point.

Its construction is unique in that it employs a stainless steel "sensing" tube which is always in direct contact with the air. Hermetically sealed within the tube are silver electrical contacts. Expansion of the tube with heating of the surrounding air brings the contacts directly together to sound an alarm or to operate extinguishing equipment. Units are available for either normally open or normally closed circuits.

Temperature settings up to 325 deg. F. may be had. An area as large as 625 square feet can be protected by a single unit.



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1951

CONVERTS STANDARD CARS FOR SPECIAL DUTY

EMERGENCY production orders for converting standard rolling equipment to suit specialized needs are being handled with greater dispatch through arc welding. By properly applying the economies of welded steel construction, car shops today are effecting such modifications with less material and with fewer man-hours. The resulting construction is also found to be stronger, more rugged to withstand the severe impact and loading requirements of modern railroading.

Latest welding techniques for simplifying and speeding your maintenance repairs are available on request. Write for them.

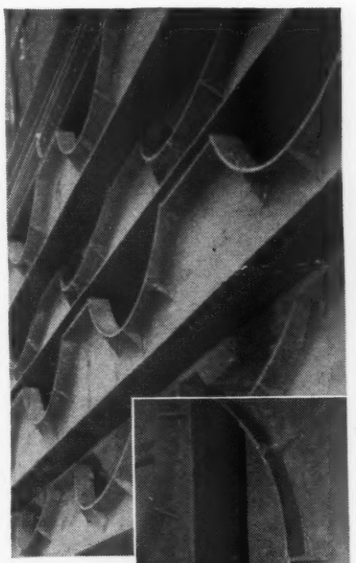


Fig. 3. Versatile "Fleetwelder" *300 amp Lincoln AC arc welder with "Arc-Booster." Built to handle a wide range of car shop repairs.*

Fig. 4. Wheel Transportation Car *is made up by adding individual supports fabricated from plate. Components are flame cut, formed to shape and fillet welded with Lincoln "Fleetweld 11" electrode.*

SAVES CRITICAL MATERIALS

Fig. 1. Reclaims friction draft casing. *Cracked and worn malleable iron casting is recovered by building up bearing surfaces with Lincoln "Ferroweld" electrode.*

AND BUILDS STRONGER UNITS

Fig. 2. Replacement spring saddle *is fabricated from 3 pieces of plate . . . saves on delays, saves on costs.*

MODIFIES CAR CONSTRUCTION AT LOWER COST

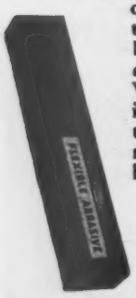
For further information about arc welding procedures and equipment, write The Lincoln Electric Railway Sales Co., 11 Public Square, Cleveland 13, Ohio. Railroad representatives of

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 1, OHIO

- **Cleans Commutators**
- **Gives Burnished Finish to Commutators After Grinding**

The perfect tool for use following grinding or using a regular Resurfacer on the commutator. Made of a fine grain abrasive material held together by a flexible bond. It's gentle, fast action quickly removes surface imperfections with minimum cutting . . . Used as a commutator cleaner it quickly removes high resistance film, dirt and grease. Cleans like an eraser and generates very little dust—wears down slowly without "gumming" or dusting. Does not affect the face of the brush or cause filling of commutator slots. Non-conductive and non-loading — can be safely used with motors or generators operating. *Will not scratch or score commutators or rings . . .* Very easy to use. Just hold it against the face of the turning commutator or slip ring. FIVE SIZES — Order by Catalog number.



82-001	⅜ x ½ x 5
82-002	⅜ x ¾ x 5
82-003	⅜ x 1 x 5
82-004	1 x 2 x 5
82-005	1 x 4 x 5

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☐ Resurfacers ☐ Undercutters

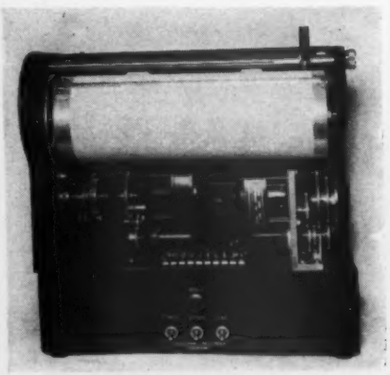
NAME.....
COMPANY.....
ADDRESS.....
CITY.....ZONE.....STATE.....

Work pieces are infinitely adjustable from 8 to 96 r.p.m., utilizing a 3 hp. d.c. motor for the work drive. The headstock may be swivelled 90 deg. for face grinding operations.

Dual controls are available so that the machine may be operated either from the front or from the rear, depending on the shape of the work piece. The hydraulic traverse is adjustable to any desired speed between 3 to 130 in. per minute. The swivel table is adjustable for grinding tapered work pieces.

Reservoirs for coolant, hydraulic oil and lubricating oil are all in the bed casting. Electrical motors and control are raised to permit easy servicing of these parts. This machine is also available as a plain grinder for single purpose high production operations.

◆

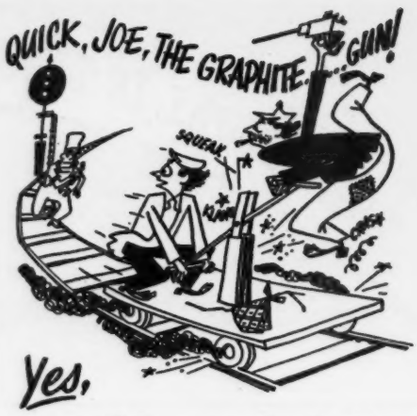


Self-Contained Strip-Chart Recorder

A portable strip-chart recorder of the X-Y type for plotting automatically on rectangular coordinates the simultaneous relationship between any two variables that can be made to actuate Microformers, is announced by Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

The recorder, identified as the MD-2, may be used with any testing machine in which hydrostatic pressure in either the loading or weighing system is proportional to load applied to the specimen. For these applications, separate Bourdon tube units are available for permanent attachment to the hydraulic system of each testing machine with which the recorder may be used. It can also be used with some types of testing machines having mechanical loading and weighing systems.

Sensing Microformer core movements of 0.03 in. and 0.06 in. can produce full scale, 10 in., displacement of the stylus and core movements of 0.03 in., 0.06 in. and 0.120 in. can produce drum rotation of 10 in. Each of the recording elements, when used with an external Microformer, has a recording sensitivity of 0.000015 in. Full scale 10-in. response of the stylus across the chart can be obtained in approximately 6 seconds on the full scale-range, and in approximately 3 seconds on the half scale-range.



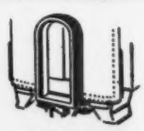
Yes, everything works better with Dixon Graphite!

FOR EXAMPLE:

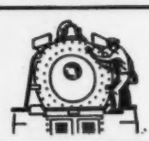
PANTAGRAPHS eliminates friction

SWITCH PLATES no dirt pick-up

CENTER PLATES won't squeeze out


DIAPHRAMS won't wash off

PIPE JOINT COMPOUND stays flexible


ENGINE FRONT FINISH, resists heat

Dixon *Natural* Graphite is unaffected by extremes of temperature —is inert, won't wash off or squeeze out under pressure — doesn't pick up road dirt or dust. For real operating economy use Dixon wherever you have a tough maintenance problem.

SEND FOR FREE SAMPLE of Dixon 1924 — Quick Drying Lubricant. Try it — it's an effective, long lasting dry lubricant, superior to oil and grease for many applications. Also, ask for your copy of technical report "Natural Graphite." Joseph Dixon Crucible Company, Jersey City 3, N. J.

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• 1924 Quick Drying Lubricant • Center Plate Lubricant • Graphite Seal • Pipe Joint Compound • Brake Cylinder Lubricant • Engine Front Finish • Graphite for Compounding • Lathe Center Lube